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A PARALLEL STUDY OF LABOR IN YOUNG AND OLD PRIMIPARAS*

BASED UPON A CRITICAL ANALYSIS OF 372 CASES BELOW TWENTY
AND ABOVE THIRTY-FIVE YEARS OF AGE

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WITHIN the past two decades, late marriage and low birth rate have become important aspects of a world-wide economic and sociologic upheaval. Many women are purposely avoiding maternity on the ground that they are too old to bear children without great hazard to themselves. In addition, such women are very often unfavorably influenced by the belief of the laity in a frequently dangerous, and occasionally even fatal issue in such a labor. This erroneous supposition is immediately given additional weight by haphazard lay and at times, quasi-scientific medical advice. It seemed, therefore, that it would be profitable to undertake a critical analysis of labor on a comparative basis, in young and old primiparas, in an effort to arrive at reasonably accurate conclusions.

The question at once arises, however, who is an old primipara? A careful survey of the leading textbooks on obstetrics and the literature in general fails to disclose a unanimity of opinion on this important phase of the subject, age limits from twenty-eight years to forty years having been employed by various authors. I have therefore chosen elderly white primiparas of thirty-five years and over, from the ward

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and private services of the Woman's Hospital, New York, and compared them to a similar group of women twenty years and under, as the primary objective was to study diametrically opposed groups of patients who were being subjected for the first time to the tests of labor at or near full term.

AGE DISTRIBUTION OF CASES

In Chart 1 the age distribution of the cases is shown both graphically and numerically. It will be noted that in the series of young primiparas, the largest number occurred in the twenty year group, whereas the

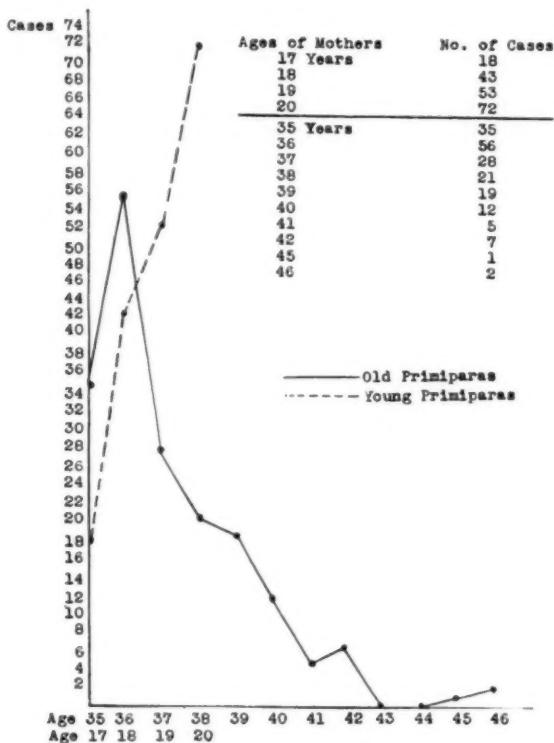


Chart 1.—Age distribution of cases in young and old primiparas.

majority of cases of the old primiparas were present in the thirty-six-year group, although the extreme age limits for both groups were seventeen years and forty-six years, two cases of the latter being found among the old patients.

TYPES OF PELVES

Chart 2 shows the types of pelvis encountered in both young and old groups. It is rather significant to note that a higher percentage of normal pelvises occurred in the old primiparas than in the young patients. Of the abnormal types of pelvises, however, the justominor class occurred in 17.32 per cent of the cases in the young primiparas, and in only 7.69

per cent of the old patients. There was only a slight difference in the incidence of the simple flat pelvis in both groups, but the funnel or male type of pelvis occurred one and one-half times as often in the old primiparas as compared to the younger group. Stated in other terms, from the practical standpoint, if dystocia of bony origin is to be encountered, it would appear that the difficulty would be more frequent at the inlet in the young primipara, and at the outlet in her older sister.

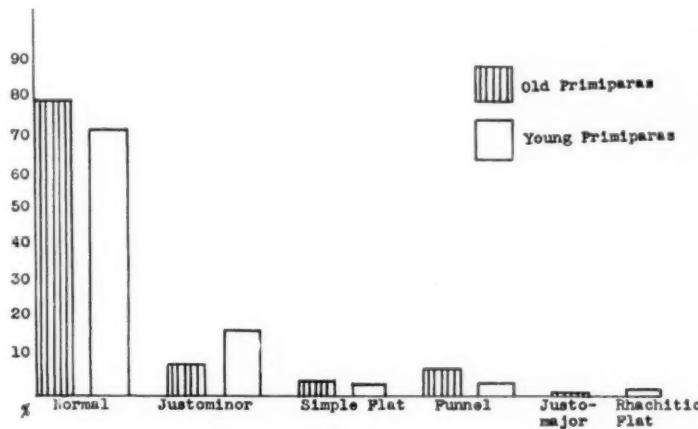


Chart 2.—Types of pelvises encountered in young and old primiparas.

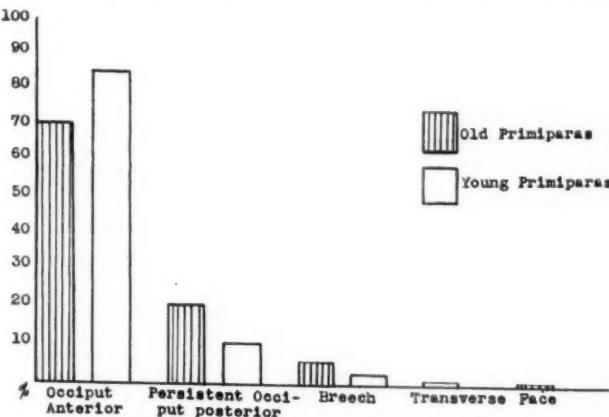


Chart 3.—Presentations and positions encountered in young and old primiparas.

PRESENTATIONS AND POSITIONS

Chart 3 sheds some rather interesting data. While the occipito-anterior position occurred in 85.71 per cent of the young primiparas, its incidence in the old group was 71.33 per cent. Occipitoposterior positions of the persistent type, however, were twice as frequent in the old primiparas as in the young ones, the readings being 21.94 per cent and 10.28 per cent, respectively. Breech presentations were also approximately twice as frequently encountered (6.09 per cent) in the old patients.

as in the young primiparas (3.42 per cent). Practically the same ratio has been reported by Schulze and Nixon in their series of old primiparas. The very low incidence of the less frequent malpresentations (face, transverse, etc.) does not permit any deductions to be drawn. The interpretation of the figures presented in this table undoubtedly warrants the conclusion that persistent occipitoposterior positions and breech presentations occur twice as often in the old primiparas as in the younger patients, and undoubtedly constitute important contributing factors responsible for the longer labors and more particularly for the greater incidence of operative interference in old primiparas.

RUPTURE OF THE MEMBRANES

The time of the rupture of the membranes in relation to the various stages of labor, and its effect upon the duration of labor still remains a

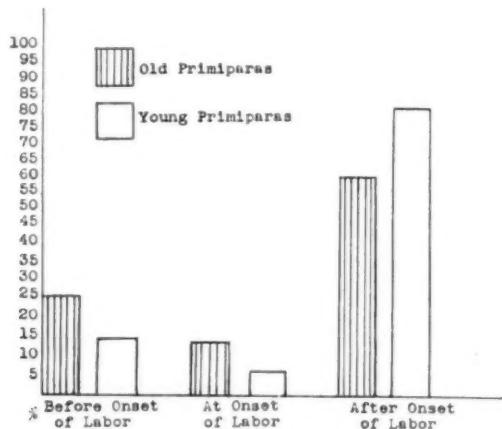


Chart 4.—Occurrence of rupture of membranes (spontaneous) in young and old primiparas in relation to onset of labor.

moot question among obstetricians. In view of the fact therefore, that there was only a difference of 11 per cent as affecting the old primiparas in the incidence of premature rupture of the membranes, I feel that no definite conclusions are warranted. It is interesting to record that similar findings were obtained by Essen-Möller and Linden who coincide with the opinion expressed in this communication on the rupture of the membranes in relation to labor, in old primiparas.

DURATION OF PREGNANCY

From time to time assertions have been made that pregnancy is of longer duration in the old primipara than in her younger sister. One, of course, is quite willing and, in fact, forced to admit that the actual duration of pregnancy is extremely difficult, if at all possible to estimate. Nevertheless, employing the usually adopted rule, it is surprising to

note that the average duration of pregnancy in the young group of patients was 281.33 days as contrasted to 279.42 days in the old primiparas. In other words, pregnancy was actually of longer duration in the group of younger patients in this series, as shown in Chart 5.

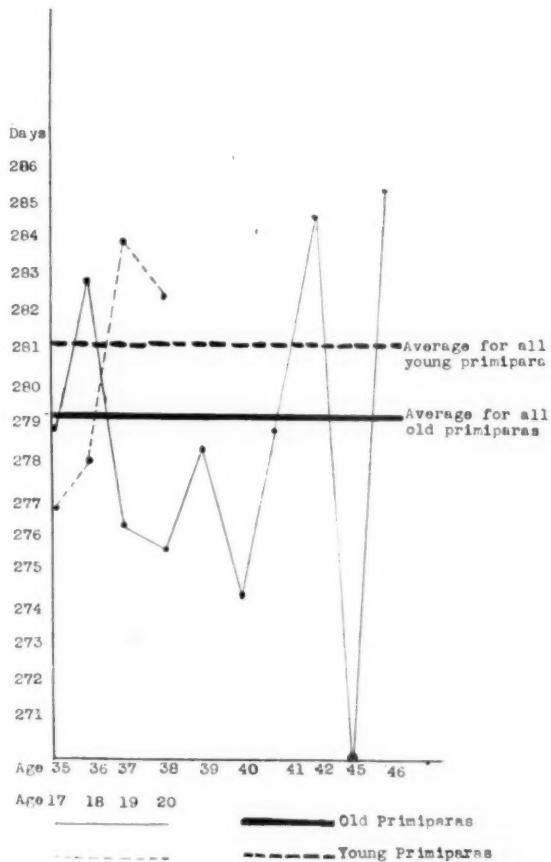


Chart 5.—Average duration of pregnancy (in days) in various age groups of young and old primiparas.

DURATION OF LABOR

It has been repeatedly stated by most writers and indeed it is the common belief of most obstetricians that the duration of labor among old primiparas is usually longer than in the young patients. This is definitely substantiated by the findings in this series as shown in Chart 6, and is a confirmation of the reports of other writers, notably Harris, Schulze, Nixon, and Daichman, but at variance with that of Quigley. The difference is most marked in the first stage where the average duration was seventeen hours and twelve minutes, and twelve hours and forty-eight minutes for the old and young primiparas, respectively. The average duration of the second stage was one hour and thirty-four

minutes in the old patients as compared to one hour and nineteen minutes for the patients in the young group. Oddly enough the duration of the third stage was slightly longer in the young group in whom the time was twenty-three and one-half minutes as compared to seventeen minutes for the old patients, in whom as it will be seen later, complications of the third stage were more frequently encountered.

In view of the fact that there is only a slight difference in the weight of the children in either group as is shown in Chart 9, the relatively short labor in the patients cannot be adequately explained on the ground that the baby is small, but rather that it is dependent upon a combination of factors, notably the greater incidence of abnormal presentations among the old patients, and especially the greater elasticity of the soft parts of the young primiparas.

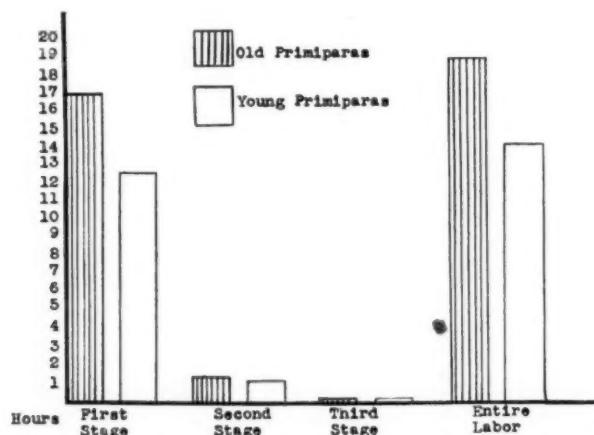


Chart 6.—Average duration of labor in young and old primiparas.

TERMINATION OF LABOR

Chart 7 is productive of some rather interesting findings. At the outset however, it must be stated that prophylactic low forceps and episiotomy is a very common elective procedure in many primiparas on the ward service and certainly is very frequently practiced by the members of the courtesy staff of the hospital. Hence, the cases terminated by low forceps do not actually enter into the final conclusions. The complete figures are as follows: Labor terminated spontaneously in 11.83 per cent of the old patients as compared to 31.21 per cent of the younger group, while prophylactic low forceps was employed in 46.77 per cent of the older patients and in 53.76 per cent of the young primiparas. When, however, one investigates the incidence of major obstetric procedures, interesting data are at once evident. Midforceps operations were employed in 20.45 per cent of cases of the older patients as contrasted to 10.21 per cent in the younger group. One high forceps was done in

one case of each group. Breech extraction was performed in 4.83 per cent of the old primiparas, and in 2.68 per cent of the younger patients, while internal podalic version was done in 4.3 per cent of cases of the old patients, and in only 1.61 per cent of the younger group. It is to be noted that eranotomy was not resorted to in either class of patients. The necessity for the greater frequency of major obstetric procedures excluding cesarean section in the older patients is, I feel, very closely allied to the greater incidence of inertia uteri, persistent occipitoposterior positions, and breech presentations in this group as shown in Chart 3.

We now come to the question of cesarean section, and here there is undoubtedly such a marked discrepancy in its incidence in both groups as to call for very close study of this phase of the subject. The opera-

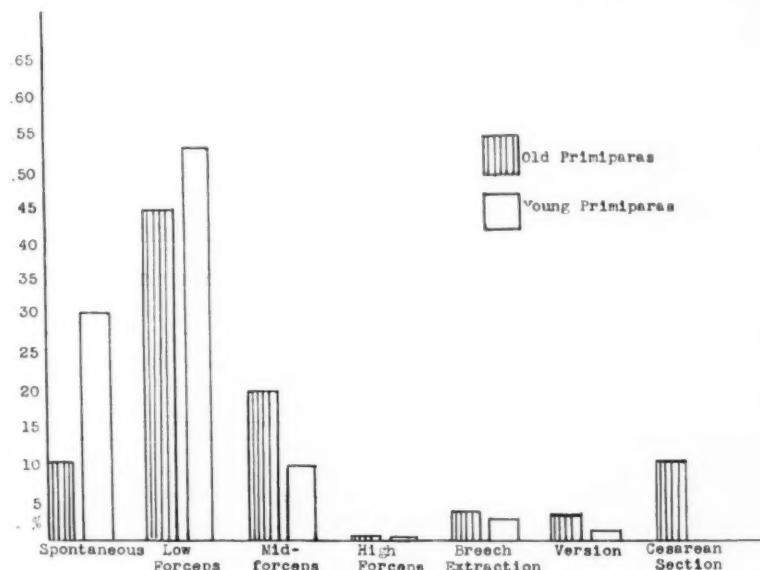


Chart 7.—Termination of labor in young and old primiparas.

tion was performed in twenty cases, or 10.75 per cent of the old primiparas, while no patient in the younger group was subjected to cesarean section. Quigley reported an incidence of 11.4 per cent in his series of old primiparas of thirty years and over, while in Daichman's series of patients over forty years of age cesarean section was performed in 23 per cent of the cases. The indications which account for the high incidence of the operation in the older group are shown in the brief synopses of the individual cases in Table I.

An impartial analysis of these cases must, I feel, lead to the conclusion that in practically every instance cesarean section was definitely indicated on more than one premise, the most important of which was *not* the advanced age of the patient. The definite existence of various degrees of pelvic deformity usually associated with other potent contribut-

TABLE I. INDICATIONS FOR CESAREAN SECTION IN OLD PRIMIPARAS

AGE	INDICATIONS	OPERATION	MOTHER	BABY
35	True cervical dystocia after trial labor of 18 hours	Low-flap	Living	Living
35	Marked funnel pelvis	Low-flap	Living	Living
35	Justominor pelvis with large baby at term. Mother had moderate bleeding during eighth month of pregnancy. Baby weighed 9 pounds 11 ounces	Classical (elective)	Living	Living
36	Membranes ruptured ten hours before onset of labor, cervix rigid and nonyielding, no advance after several hours of good uterine contractions; mother exhibited slight cardiac arrhythmia	Low-flap under spinal anesthesia	Living	Living
36	Justominor pelvis, unengaged head, secondary inertia uteri, irregular labor of 18 hours	Low-flap	Living	Living
36	Marked hepatic toxemia in last month, with marked jaundice and marked liver disturbance substantiated by chemical studies and liver function tests. No improvement in spite of vigorous antitoxic treatment	Low-flap	Living	Living
37	Justominor pelvis with true conjugate of only 8 cm.; breech presentation	Classical (elective)	Living	Living
37	Uterus contained a large fibroid which produced bleeding during the first five or six missed periods. In addition patient had moderate toxemia	Elective low-flap followed by supracervical hysterectomy	Living	Living
37	Failure of head to engage in presence of male pelvis and overriding of symphysis after trial labor of 50 hours	Low-flap	Living	Living
37	Simple flat pelvis, persistent mento-posterior position, rigid cervix which did not yield after trial labor and rupture of membranes seven hours prior to onset of labor	Low-flap	Living	Living
38	Marked funnel pelvis with deep symphysis. Patient weighed 210 pounds at term	Low-flap (elective)	Living	Living
38	Marked rectal stricture following previous Whitehead operation	Classical (elective)	Living	Living
39	Multiple fibromyomas of uterus, premature rupture of membranes at term; patient weighed 225 pounds	Low-flap	Living	Living
40	Patient weighed 266 pounds and was treated for hypertension and toxemia for several weeks; urine showed granular and hyaline casts; uterus contained multiple fibroids	Elective classical under spinal anesthesia, followed by hysterectomy	Living	Living
41	Marked funnel pelvis, large baby	Classical (elective)	Living	Living

TABLE I—CONT'D

AGE	INDICATIONS	OPERATION	MOTHER	BABY
41	Marked toxemia, with no improvement under conservative treatment. Patient had a threatened miscarriage in tenth week. Uterus contained a few small fibroids	Low-flap	P.P. phlebitis recovered	Dead; had many anomalies
42	Premature rupture of membranes, trial labor of 16 hours, nonengagement of head, nonyielding cervix, in presence of justominor pelvis of moderate degree, and persistent occipitoposterior position	Low-flap	Living	Living
45	Married twenty-seven years, no previous pregnancies, funnel pelvis, unengaged head. Patient died on seventh day postoperative of acute suppression of urine beginning twenty-four hours after operation. Terminal bronchopneumonia	Classical (elective) at term	Dead	Living
46	Married twenty years, no previous pregnancies; patient had asymptomatic lues with four-plus Kahn and Wassermann reaction. Treated by me during pregnancy. Baby weighed 8 pounds 10 ounces	Low-flap (elective)	Living	Living
46	Minor degree of pelvic contraction advanced age of patient. Patient had postpartum hemorrhage, transfusion, died within two hours after operation	Elective low-flap	Dead	Living (8 pounds 5 ounces)

ing factors such as a nonyielding cervix, pelvic neoplasms, progressive toxemia, etc., is noted in practically every case in this group.

While an incidence of 10 per cent of cesarean section may at first appear to be high and almost suggestive of radical obstetrics, nevertheless it is of utmost importance not to lose sight of the fact that in the ease of the old primiparas so much is at stake that everything ought to be done to help her obtain a living child. In this connection therefore, it is interesting to compare the results obtained by the so-called conservative clinics. Nixon of London has recently reported a series of elderly primiparas in whom no cesarean sections were performed with a maternal mortality of 4 per cent, and a fetal mortality of 17 per cent; in other words, a maternal and fetal mortality three times and five times as high, respectively, as that reported in this study, notwithstanding our cesarean incidence of 10 per cent. Nixon, however, is frank to admit that the operation should have been resorted to in his series of cases.

Essen-Möller has reported a cesarean incidence of 7.76 per cent with a maternal mortality of 0.97 per cent for his entire series of old primiparas, and a fetal mortality of 8.25 per cent. Linden of Stockholm, who also follows ultraconservative procedures reports a series of cases in

elderly primiparas, in whom craniotomy was performed in 4 per cent of the cases with a total fetal mortality for the entire series of 8.8 per cent but no maternal deaths.

Notwithstanding however, the justifiability for the high incidence of cesarean section in this series, I am firmly convinced that if we were to subscribe inflexibly and to teach that the operation is indicated in every case of the old primipara, a gross exaggeration not based upon our present experience would be the result, for as will be seen from the cases contained in this communication, 89.25 per cent were delivered per vaginam. Even more significant is the fact that a considerable number of these patients were over forty years of age when they were delivered uneventfully of living children after comparatively short labors. In Quigley's series, 88.6 per cent of the old primiparas were also delivered per vias naturales.

INERTIA UTERI

It has been claimed by some writers that the part played by the rigidity of the soft tissues in elderly primiparas from the standpoint of prolonging the labor and producing dystocia, is problematical so far as it must be estimated objectively. It is important, therefore, to recall the investigations of Ogata, who found the uterus to be well supplied with connective tissue and poorly supplied with muscle tissue at the beginning and end of the period of sex maturity. He also showed that beginning with the twenty-sixth year there is a distinct deterioration which increases successively, as a result of which weak labor or inertia and rigidity of the soft tissues in the parturient canal of the elderly primipara obtain.

From the clinical study herewith presented one is firmly convinced that uterine inertia is a definite complication of labor in the old primipara. In this series, primary uterine inertia occurred in six cases of the old group, and was entirely absent in the young patients, while secondary inertia was present in three cases of the old primiparas and only once in the young group. The incidence of both primary and secondary inertia in the young and old patients, therefore, was 4.83 per cent and 0.53 per cent, respectively, a disparity sufficiently marked to stamp it as a potential factor to be contended with when delivering an old primipara.

INCIDENCE OF PELVIC NEOPLASMS

As would be expected there is a marked discrepancy in the incidence of pelvic neoplasms in both groups of patients. Fibromyomas of the uterus were present in fourteen cases or 7.52 per cent of the old primiparas as compared to two cases or 1.07 per cent of the young group. Ovarian cysts were encountered in only one case of the old patients, and an incidence of 0.53 per cent, and were absent in the entire group of young patients.

While the presence of these pelvic tumors cannot per se account for the greater incidence of operative deliveries in old primiparas, they nevertheless do constitute contributing factors to the more frequent necessity for the artificial aid rendered to this group of patients, and to the greater frequency of immediate postpartum complications, of which hemorrhage is an important one.

INCIDENCE OF STILLBIRTHS

The stillbirth mortality, excluding those cases where the fetal heart was not heard at the time of the admission of the patient to the hospital, was 3.20 per cent and 1.06 per cent in the old and young groups, respectively. The various causes of these fetal deaths are herewith appended, but the fact that the incidence was three times as high in the children born to the older patients entitles it to an important place in the conclusions of such a study, notwithstanding whatever causes we may assign to it as an explanation. Essen-Möller reported a fetal mortality of 8.25 per cent, Linden 8.8 per cent, Nixon 17 per cent, and Quigley 5 per cent stillbirth incidence in their series of old primiparas.

MATERNAL MORTALITY

Here again the old primiparas showed a greater tendency to an unfavorable outcome than did their younger sisters. There was no maternal death among the young patients, while three deaths occurred among the older group, a maternal mortality of 1.61 per cent. A synopsis of these cases shows that hemorrhage was responsible for two deaths, while failing kidney function, most probably with an old standing but undetected renal pathology, accounted for the third death on the seventh day following elective cesarean section, in a primipara forty-five years of age.

SEX OF CHILDREN

It has been stated by various authors that elderly primiparas give birth to more male children than do younger women. In this series, 51.87 per cent of the children born to the older patients were males as compared to 47.87 per cent of male children born to the younger group. This is practically the same percentage as is found for all children delivered by all types of patients, the usually accepted ratio being 51.20 per cent and 48.80 per cent for male and female children, respectively.

WEIGHT AND LENGTH OF CHILDREN

Assertions have been made by a number of writers that old primiparas tend to give birth to larger children than do young patients. On that account therefore, a careful study was made in this series to affirm or

deny the accuracy of such statements. The average weight as shown in Chart 9 for all children born to the old primiparas was seven pounds four and three-fourths ounces, as compared to seven pounds three and one-half ounces for the young group, with a tendency for the male children to be somewhat heavier than the female children. The average length for all children delivered by the old patients was 50 em. as compared to 50.11 em. for the children born to the young primiparas. Here again there was a very slight difference in favor of the male children in both groups.

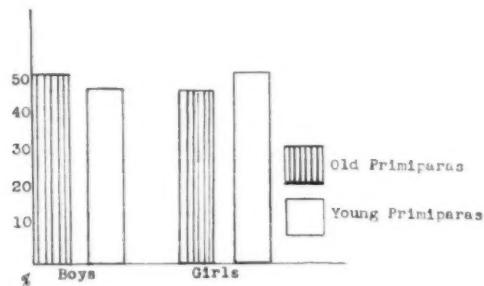


Chart 8.—Sex of children born to young and old primiparas.

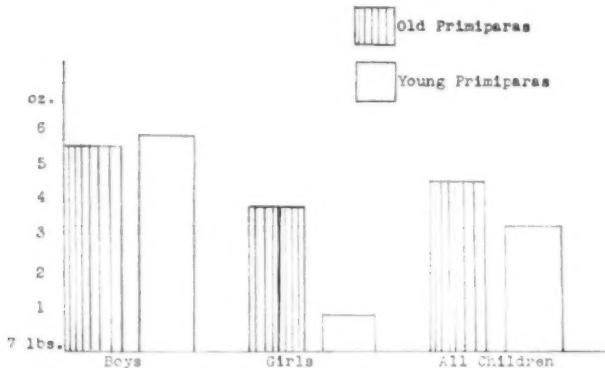


Chart 9.—Average weight of children born to young and old primiparas.

COMPLICATIONS DURING PREGNANCY AND LABOR

Mild toxemia occurred in thirteen cases or in 6.98 per cent of the young patients and in seventeen cases or 9.13 per cent of the old group, while severe toxemia was encountered in four cases or 2.14 per cent of the old primiparas as compared to one case or 0.53 per cent of the young patients. In the antepartum period, pyelitis was present in one case or 0.53 per cent in each group, and in the postpartum period in three cases or 1.61 per cent of the old patients, and not at all in the young group. Sapremia was present in six cases or 3.20 per cent of the old primiparas, as compared to eleven cases or 6 per cent of the young patients. The

marked difference in these figures is difficult of explanation in the light of the greater frequency of major obstetric procedures among the older patients. It is also interesting to note the complete absence of placenta previa and premature separation of the placenta in both groups, thus confirming the generally accepted view that these lesions are more frequently encountered in multiparas than in primiparas.

Mastitis, either simple or suppurative, was not at all encountered among the old primiparas, but was present in eight cases or 4.30 per cent of the young patients. The only possible logical explanation for this finding is the fact that breast feeding was more frequently resorted to among the young patients, thus predisposing them to inflammatory processes affecting the breasts.

Of the immediate postpartum complications, hemorrhage was present in seven cases or 3.76 per cent of the old patients as compared to four cases or 2.14 per cent of the young group, while retained placenta occurred in two cases or 1.07 per cent of the old primiparas and not at all among the young patients. From this study therefore, we are justified in concluding that complications of the third stage of labor are twice as frequent in old as in young primiparas, and that toxemia occurs one and one-half times as often in the old patient as in her younger sister.

RELATION OF LABOR TO THE MENSTRUAL CYCLE

Considerable thought was given to the possible relation of the menstrual cycle of the patient to the type and particularly to the duration of labor in each case. While definite conclusions are not warranted, nevertheless some highly suggestive findings were present in a number of cases, and it is hoped that more extended studies will be possible at some future date in order to clarify this aspect of the subject. It is interesting to note, however, that where there was a definite history of irregularity in the menstrual function and particularly where menstruation was established rather later than usual, especially after the sixteenth year, labor in a number of cases was of longer duration than otherwise. As previously stated, however, one is not prepared to draw definite conclusions at the present time as the number of cases is too small to warrant indisputable positive deductions.

DURATION OF MARRIAGE PRIOR TO LABOR

There is a general opinion among obstetricians, which was first proposed by Leopold Meyer, that elderly primiparas who conceive for the first time after a number of years of marriage are prone to longer and more difficult labors than those who, although they may be advanced in years, become pregnant within a relatively short time after marriage. In eighty-two cases of old primiparas in this series, the exact length of time of marriage was known, and the average for this group was five years

and two months, with several patients who had been married more than twenty years. In thirteen patients who were married ten years or more prior to conception, labor lasted on an average eighteen hours and nineteen minutes which was less than the average duration for the entire series of old primiparas. In contrast to this, in thirty-two cases of old primiparas who had been married three years or less, the average duration of labor was eighteen hours and twenty-eight minutes. The findings in this study are thus at variance with the oft-repeated assumption that the time of marriage influences the duration of labor, and I am, therefore, unwilling to accept the validity of Meyer's postulates, upon which too much stress has been placed in the past, and one is led to the conclusion that too little importance is attached to the more important factors of varying degrees of pelvic contraction, inertia uteri, nonyielding cervix, abnormal presentations, etc.

SUMMARY AND CONCLUSIONS

1. It is suggested that for the sake of uniformity in future studies, that thirty-five years be chosen as the lower age limit for elderly primiparas.
2. The funnel pelvis was more frequently encountered among elderly primiparas and the justomimor pelvis among their younger sisters in this series. Dystocia of bony origin, therefore, may be the more frequent complication at the inlet in the young patient, and at the outlet in the old primipara.
3. Persistent occipitoposterior positions and breech presentations occurred in 21.94 per cent and 6.09 per cent of cases, respectively in old primiparas, in whom the incidence of these abnormal findings was twice as high as in the young patients.
4. There was a difference of only 11 per cent in the incidence of premature rupture of the membranes in elderly primiparas as compared to that of young patients.
5. Labor was of definitely longer duration in the old primiparas, the greatest difference occurring in the first stage, and this is undoubtedly accounted for by the greater incidence of abnormal presentations and inertia uteri in the old patients, and by the greater elasticity of the soft tissues in the young primiparas.
6. Cesarean section was performed in 10.75 per cent of cases among the older patients and not at all in the young group. It is of utmost importance, however, to note that the age of the patient was *not* the major indication for the operation in most cases, such potent contributing factors as pelvic deformity, nonyielding cervix, progressive toxemia, etc., being present in the great majority of cases of the elderly primiparas in whom cesarean section was performed.
7. Inertia uteri, both primary and secondary, was nine times as frequent in the old as in the young patients, and is a potential factor to be contended with when delivering an old primipara.

8. The stillbirth incidence was three times as high among the children born to the older patients as compared with those of the mothers in the young group.

9. The maternal mortality in the elderly primiparas was 1.61 per cent, while none of the young mothers died as a result of pregnancy or labor.

10. The age of the primipara has little or no influence upon the sex, weight, or length of her children.

11. Toxemia occurred one and one-half times as often in the old patient as in her younger sister, while complications of the third stage of labor were twice as frequent in the former as in the latter.

12. Irregularities in menstruation, and particularly the late establishment of the function seemed to influence the type and duration of the labor.

13. From the findings in this series, the time of marriage does not appear to influence the duration of labor.

14. In the last analysis, on the basis of this study, no inflexible rules can be laid down for the routine conduct of labor in the elderly primipara. Individualization of each case with its concomitant demands, guided by the experience, judgment, and ability of the attending obstetrician, would appear to be the only ideal approach to the solution of the problem.

I desire to express my deep appreciation to Dr. George Gray Ward, Chief Surgeon of the Woman's Hospital, New York, for the privilege of allowing me to undertake this study, and for much valuable help and criticism in the preparation of the paper.

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2 WEST EIGHTY-SEVENTH STREET

Smith, J.: A Further Investigation into the Source of Infection in Puerperal Fever. J. Obst. & Gynec. Brit. Emp. 40: 991, 1933.

In 41 cases of puerperal fever in which *Streptococcus hemolyticus* was isolated from the uterus, it was found that 32 of the patients were infected from a focus in the attendant and 9 from a focus in the patient herself. Of these 41 patients the source was traced to the throat or nose of the attendant in 31 instances and to the throat or nose of the patient in 8 instances. In 2 cases, 1 attendant and 1 patient, the source was a septic focus elsewhere in the body.

WILLIAM F. MENGERT.

THE EFFECT OF ADMINISTRATION OF PREPARATIONS OF
GROWTH HORMONE OF THE ANTERIOR LOBE OF THE
PITUITARY UPON GESTATION AND THE WEIGHT
OF THE NEWBORN (ALBINO RATS)*

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THE consideration of the interrelationship of the pituitary and pregnancy brings into question the influence of the hormones of the anterior pituitary upon the course of pregnancy and the development of the young. The present report is a study of the effect of the growth hormone of the anterior lobe upon the maternal weight changes of the albino rat during gestation and upon the weight of the newborn young. The problem has been undertaken at the suggestion of Dr. Fred L. Adair.

Teel, 1926,⁶ treated pregnant rats with an alkaline extract of the anterior lobe. This extract was potent in growth hormone but it contained appreciable amounts of a factor which caused luteinization of the ovary and inhibition of estrus. Administration of this extract to pregnant rats prolonged the gestation period from two to six days and interfered with normal parturition. Treatment throughout pregnancy invariably resulted in stillborn young of greater than normal size.

Hain, 1932,^{2,3} confirmed these results and in addition, treated 6 pregnant rats with a more highly purified preparation made according to the method of Van Dyke and Wallen-Lawrence.⁷ With the exception of two rats which received hormone treatment only on the fifth and sixth days of pregnancy, the results were similar to those reported for the crude extract. In 1934, Hain⁴ extended the work to include ovariectomized pregnant rats. Neither the alkaline extract nor Phyone (growth hormone, The Wilson Laboratories) prolonged gestation in the absence of the ovaries.

Sontag and Munson, 1934,⁵ administered antuitrin-G (growth hormone, Parke, Davis and Co.) to twelve pregnant rats. These workers reported prolongation of gestation and young which were heavier than the controls and which were often stillborn.

In the present investigation, growth hormone preparations have been made from beef anterior lobes according to the method of Van Dyke and Wallen-Lawrence.⁷ Some preparations when administered to pregnant rats prolonged gestation and interfered with normal parturition; other preparations permitted normal delivery at term. It has been concluded that the growth hormone is not responsible for prolongation of gestation observed with some preparations. The young of normal term development have been found to be heavier than the controls.

*This work has been conducted under a grant from The Douglas Smith Foundation for Medical Research of the University of Chicago. The writer is indebted to Emporia M. Fisher for technical assistance.

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Selection of Animals.—Albino rats of the University of Chicago Wistar strain were employed in this study. Young rats with a history of one normal litter were used for the preliminary work but a more detailed standardization was necessary for the later work. The animals weighed from 170 to 200 gm. at the beginning of the first pregnancy. Chart 1 shows that at this weight the females of this colony have reached the weight plateau and are thirteen to eighteen weeks of age. In this later work, hormone preparations were administered only during the second pregnancy. Only those rats were treated which had a first pregnancy history of a gestation period of twenty-one or twenty-two days with normal parturition, and which produced first litters of four or more young with a mean weight per litter within the range of 4.5 to 5.4 gm.

Methods of Breeding.—Group breeding was employed. The animals were mated at 5 P.M. and the vaginal spread was examined for sperm before 9 A.M. of the following day. The day sperm was found was called day 1 and the preceding day,

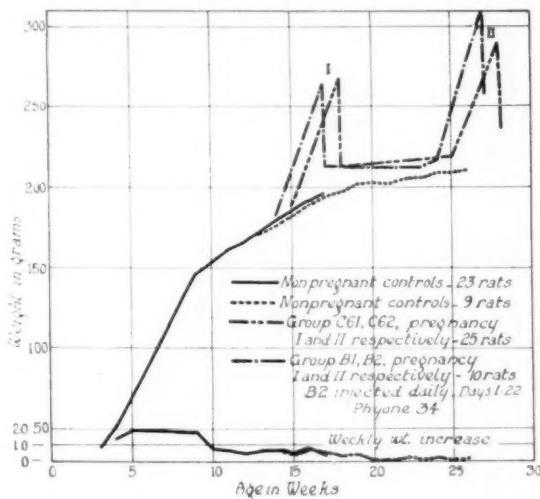


Chart 1.

day 0. The rats were kept in individual cages during gestation and lactation. They were allowed to rest three weeks before the next gestation period.

Weighings.—All maternal weights were taken in the morning before the daily feeding. The rats were weighed either daily or on days 0, 1, 5, 10, 21, 22, postpartum, at the end of the lactation period, and weekly until the next gestation period.

The newborn young were weighed individually as soon after birth as possible. A record was kept of the hour of birth and as to whether or not the young had suckled before the weight was taken.

Diet.—The rats received a constant diet consisting of yellow corn meal (whole corn), alfalfa, linseed meal with oil, casein, calcium carbonate, sodium chloride, whole milk and bread, supplemented twice weekly by lettuce and ground beef.

Growth Hormone Preparations.—Growth hormone preparations were made from anterior lobes of beef pituitary glands according to the method of Van Dyke and Wallen-Lawrence.⁷ The anterior pituitary glands from which extracts were made in this laboratory and all other preparations were kindly furnished by Dr. David

Klein of The Wilson Laboratories. Early preparations contained a substance which prolonged the gestation period and interfered with normal parturition but later preparations were free from this factor.

Assay of Growth Hormone Preparations.—All preparations were assayed in this laboratory according to the method of Van Dyke and Wallen-Lawrence.⁷ Dilutions of growth hormone preparations were used which caused a 3 to 4 per cent increase in the weight of the injected group (10 female rats) over the control group in a three-day injection period.

Injection Method.—Growth hormone preparations were injected subcutaneously daily during the experimental period. The dose was proportioned to body weight throughout the injection period.

Statistical Interpretation.—The significance of the mean values of the various control and experimental groups has been tested by the *t*-test method recommended by Fisher¹ for the comparison of small groups. The value "P" is the probability that the means compared could have been obtained by random sampling of the same population. For example, $P = 0.01$ signifies that there is one chance per 100 that the mean values from which this probability was computed could have been obtained without any treatment, by merely drawing another sample from the control group. The probability of 0.01 or 0.02 has been considered to show significant difference in the means. Values are expressed in terms of the standard error.

CONTROL GROUPS

Control groups have been compiled for comparison of maternal weight changes during gestation or for weights of newborn young or both. Since it is desirable in comparison of these values to know the number of the pregnancy or litter, the data have been arranged according to these numbers. In a series of 500 normal pregnancies in this colony, only 75 rats were followed throughout their first two pregnancies. Consequently, some of the rats appear in more than one control group. For example, Group C 61 was selected from Group C 21 to fit experimental Group B 1 in which the number per litter was larger. Within each group, the same rats appear in the first and second pregnancies, e.g., in Groups C 21 (first pregnancy) and C 22 (second pregnancy).

It is difficult to affix definite standards for maternal weight changes because the female rat never attains complete growth stasis. The weight changes are complicated further by the fact that there is a permanent weight increase due to pregnancy (see Chart 1).

Standardization of the litter values has been attempted by excluding litters with less than four young and by discarding rats which produced first litters in which the mean weight of young has fallen outside the range of 4.5 to 5.4 gm.

SELECTION OF STANDARDS

1. Term.—In a series of 328 pregnancies timed from the finding of sperm in the vaginal spread, delivery occurred on the twenty-second day in 286 cases (87.2 per cent), on the twenty-third day in 38 cases (11.6 per cent) and at other times in 4 cases (1.2 per cent). In this work delivery on the twenty-second or twenty-third day has been considered normal.

2. *Number of Young Per Litter.*—For purposes of standardization litters of less than four have been excluded from all groups. Consideration of 114 first litters and 53 second litters showed that 96.5 per cent and 96.2 per cent, respectively, of these litters had more than four young per litter.

3. *Mean Weight of Young Per Litter.*—General observation of a large series of consecutive litters indicated that each rat tends to produce young of the mean weight for the colony. A rat which produces a first litter with a mean weight of young near that of the colony will tend to produce a second litter with the mean weight of the young within the same range. If the first litter is far removed from this range the second litter will bear no definite relation to the first litter but will tend to approach the mean for the colony.

To test the validity of this observation, a group of 57 rats which produced first and second litters with more than 3 young was analyzed. In this work the "normal" range of the mean weight of young per litter has been arbitrarily selected as 4.5 to 5.4 gm. Forty-five rats (78.9 per cent) produced first litters with the mean weight of young within the range 4.5 to 5.4 gm. and 12 rats (21.1 per cent) produced young with a mean weight outside this range. Of the 45 rats which produced young within this range in the first litter, 34 rats (75.6 per cent) produced second litters with young within this same range, 5 rats (11.1 per cent) exceeded this range by ± 0.1 gm. and 6 rats (13.3 per cent) fell definitely outside the range.

Comparisons of the mean weight of young of second litters of different groups have been considered most reliable when this type of selection has been employed for first litters in both the control and experimental groups. Only rats which produced first litters with a mean weight within the range 4.5 to 5.4 gm. have been used for experimental purposes in their second pregnancies. This type of selection in the first pregnancy does not affect the mean weight of the young of the second litter. For example, the mean weight of the young of Group C 62 (selected rats) was 5.13 gm. and of group B 42 (unselected rats), 5.11 gm. These values are in Table IV.

THE EFFECT OF AGE AND SUCKLING UPON THE WEIGHT OF NEWBORN YOUNG

It has been reported that the weights of newborn rats are in error because the young have suckled before the weights were taken. In this work a record was kept for each newborn rat as to whether or not it had suckled before the weight was taken. Since it is often difficult to obtain weights before the young have suckled, two control groups were compiled to show the possible discrepancy in weight from this source.

In the first group the young of 44 litters were weighed at birth before suckling and then at various hours of age after suckling. These data are shown in Table I. Until after eight hours of age the mean weight of young per litter did not change. For example, the mean weight of the young of 10 litters was 5.15 ± 0.15 gm. at birth and 5.14 ± 0.13 gm. at eight hours of age. This constancy in weight exists for each litter as well as for a group of litters.

TABLE I. EFFECT OF AGE UPON WEIGHT OF NEWBORN RATS

NO. OF LITTERS	MEAN WEIGHT (GRAMS) OF NEWBORN YOUNG PER LITTER \pm STANDARD ERROR				
	SUCCESSIVE HOURS OF AGE				
	0	5	7	8	14-16
22	5.12 ± 0.09	5.14 ± 0.09			
8	4.99 ± 0.08		4.99 ± 0.07		
10	5.15 ± 0.15			5.14 ± 0.13	
4	5.27 ± 0.14				5.47 ± 0.23

The second group consists of 44 second litters, compiled according to whether or not the young had suckled before the weights were taken; the young of 9 litters (C 32+) had suckled and those of 35 litters (C 32-) had not. The data are shown in Table II. The mean weight of young for the entire group (C 32) was 5.14 ± 0.06

TABLE II. EFFECT OF AGE UPON WEIGHT OF NEWBORN RATS

GROUP NO.	PREG-NANCY NO.	NO. OF LITTERS	SUCKLED	MEAN WEIGHT (GM.) OF YOUNG PER LITTER		LITTER WEIGHT (GM.) \pm STANDARD ERROR
				NO. OF YOUNG PER LITTER \pm STANDARD ERROR	MEAN WEIGHT (GM.) OF YOUNG PER LITTER \pm STANDARD ERROR	
C 32+	2	9	+	9.8 \pm 0.5	5.26 \pm 0.08	51.28 \pm 2.33
C 32-	2	35	-	8.0 \pm 0.3	5.12 \pm 0.07	40.75 \pm 1.68
C 32	2	44	\pm	8.4 \pm 0.3	5.14 \pm 0.06	42.91 \pm 1.56

gm., for the suckled group (C 32+), 5.26 ± 0.08 gm., and for the group not suckled (C 32-), 5.12 ± 0.07 gm. Comparison of the mean weight of the young of the suckled and not suckled groups gives a probability of 0.33. Since some of the young appearing in Group C 32+ were of a maximum age considered as newborn and since experimental young were never as old as these when weighed and many had not suckled, the discrepancy in weight due to suckling has been considered negligible.

EFFECT OF NUMBER PER LITTER ON THE WEIGHT OF THE YOUNG

In order to ascertain the extent to which the number of young per litter influences the mean weight of the young, 114 first litters and 53 second litters have been arranged according to the number of young per litter. These values appear in Table III. None of the young had suckled. Except for extremes of number, the mean weight of young

TABLE III. EFFECT OF NUMBER PER LITTER ON WEIGHT OF NEWBORN RATS*

NO. OF RATS PER LITTER	NO. OF LITTERS	FIRST LITTERS		SECOND LITTERS	
		MEAN WEIGHT OF YOUNG \pm STANDARD ERROR	LITTER WEIGHT \pm STANDARD ERROR	NO. OF LITTERS	MEAN WEIGHT OF YOUNG \pm STANDARD ERROR
1	1	6.2	6.2	1	6.6
2	0			0	
3	3	5.67 \pm 0.19	16.93 \pm 0.54	1	5.5
4	3	5.73 \pm 0.19	22.80 \pm 0.70	5	5.48 \pm 0.30
5	8	5.55 \pm 0.31	27.75 \pm 1.53	3	5.43 \pm 0.19
6	6	5.05 \pm 0.14	30.27 \pm 0.84	3	5.17 \pm 0.22
7	18	5.05 \pm 0.09	35.35 \pm 0.60	9	5.28 \pm 0.10
8	21	5.10 \pm 0.07	40.80 \pm 0.58	12	5.21 \pm 0.12
9	17	5.11 \pm 0.11	46.12 \pm 1.02	9	4.90 \pm 0.11
10	16	4.86 \pm 0.07	48.54 \pm 0.69	5	5.22 \pm 0.05
11	14	4.98 \pm 0.08	54.78 \pm 0.93	3	4.73 \pm 0.10
12	5	4.86 \pm 0.12	58.24 \pm 1.29	0	
13	2	3.5 & 5.1	45.1 & 66.5	1	4.8
14	0			1	4.9
Total	114			53	
Mean of Group	8.3	5.09 \pm 0.05	41.69	7.7	5.20 \pm 0.06
					39.32

*None of these rats had suckled.

remains fairly constant irrespective of the number of young per litter. The litter weight increases progressively with the increase in the number in the litter. The calculated and observed values for the mean weights of young and the mean litter weights are presented graphically in Chart 2.

Method of Breeding.—It was suggested that selective breeding might produce young of more uniform weight than group breeding. Pregnancies 1 and 2 for a selective breeding group, in which each female was mated with the same male in two consecutive pregnancies, are represented as Groups D 11 and D 12, respectively; for a group breeding group as C 21 and C 22, respectively. These data were selected in regard to normal pregnancy history, litters of 4 or more young in both pregnancies and the mean weight of the young for the first litter within the range 4.5 to 5.4 gm. The mean weight of the young per litter for the selective breeding group was 5.08 ± 0.07 and 5.18 ± 0.09 gm. for the first and second litters, respectively; comparison gives a probability of 0.40. The mean weight of the young per litter for

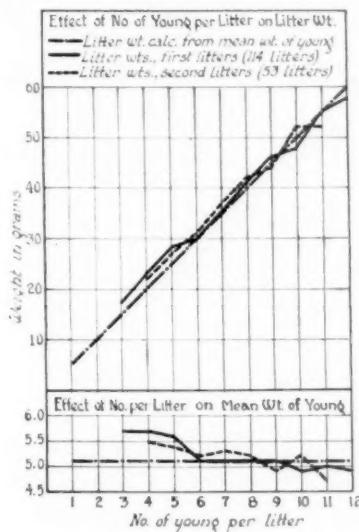


Chart 2.

the group breeding group was 5.06 ± 0.04 gm. and 5.13 ± 0.07 gm. for the first and second litters, respectively; comparison gives a probability of 0.43. Since the probability of significant difference in means is of the same magnitude for both groups, the method of breeding has not been considered to be a significant factor when a group of animals is used. These values are shown in Table IV. Better agreement was obtained between the mean weights of the young of the first and second litters of individual rats in the selective breeding group than in the group breeding group but the values were not uniform enough to justify comparison of the litters of individual animals.

Consecutive Pregnancy and Litter Values.—The number of the pregnancy or of the litter influences the value obtained. A group of 16 rats was followed through the first three consecutive pregnancies, represented as Groups B 41, B 42, B 43, respectively, in Table IV. In each case the gestation period and parturition were normal and each litter contained more than 3 young.

The maternal weight changes were greater in the first pregnancy than in the second or third. The mean maternal weight increases during 3 consecutive gestation

TABLE IV. COMPARISONS OF CONSECUTIVE PREGNANCIES AND LITTERS

GROUP NO.	PREG. NO.	NO. IN GROUP	SELECTION	MATERNAL WEIGHT INCREASE			NO. OF YOUNG PER LITTER ± STANDARD ERROR	MEAN WEIGHT OF YOUNG ± STANDARD ERROR	LITTER WEIGHT ± STANDARD ERROR			
				DAY 0-22		PER CENT						
				INCREASE	± STANDARD ERROR							
C 21	1	29	> 3	4.5-5.4	81.74 ± 3.30	43.6	26.62 ± 2.14	14.2	8.8 ± 0.3			
C 22	2	29	> 3	—	72.06 ± 2.09	32.5	17.03 ± 1.91	7.7	8.4 ± 0.4			
C 61	1	25	6-11	4.5-5.4	79.07 ± 2.84	42.2	25.58 ± 2.21	13.7	8.5 ± 0.3			
C 62	2	25	> 3	—	70.59 ± 2.26	32.3	17.10 ± 2.03	7.8	8.2 ± 0.4			
C 81	1	14	6-9	5.1-5.4	—	—	—	—	5.12 ± 0.09			
C 82	2	14	> 3	—	—	—	—	—	41.47 ± 2.03			
C 31	1	44	> 3	4.5-5.4	—	—	—	—	5.23 ± 0.02			
C 32	2	44	> 3	—	80.20 ± 2.68	42.9	28.03 ± 2.04	15.0	7.6 ± 0.6			
C 41	1	41	> 3	—	71.80 ± 2.18	32.6	18.43 ± 1.78	8.4	8.8 ± 0.3			
C 42	2	41	> 3	4.5-5.4	—	—	—	—	5.01 ± 0.04			
D 11	1	12	> 3	4.5-5.4	—	—	—	—	5.14 ± 0.06			
D 12	2	12	> 3	—	—	—	—	—	42.91 ± 1.56			
B 41	1	16	> 3	—	80.89 ± 5.33	42.7	23.91 ± 3.48	12.6	7.6 ± 0.4			
B 42	2	16	> 3	—	71.26 ± 3.63	32.3	16.10 ± 3.04	7.3	7.8 ± 0.5			
B 43	3	16	> 3	—	70.97 ± 4.32	31.1	19.68 ± 3.26	8.6	42.91 ± 1.56			

periods (day 0-22) were 80.89, 71.26, 70.97 gm. or increases of 42.7 per cent, 32.3 per cent, and 31.1 per cent, respectively. A similar difference was found in the permanent gain represented by the increase from day 0 to postpartum (P.P.). A small part of these gains can be attributed to the slope of the normal weight curve and the other part to the effect of pregnancy upon the weight curve. The normal weight curve and pregnancy curves of the first two pregnancies of similar Groups C 61 and C 62, are shown in Chart 1. Comparisons of maternal weight changes of the first pregnancy with those of the second or third are not considered reliable.

Slight differences due to the number of the litter were noted in the litter values. For example, the mean weights of the young for the first, second, and third litters were 5.16, 5.11, 5.36 gm., respectively. Comparisons of values of first and second litters are considered most trustworthy.

Comparison of First and Second Pregnancies and Litters.—After a consideration of the values obtained in a study of three consecutive pregnancies (Groups B 41, B 42, B 43) only the first two pregnancies were used for control and experimental purposes. The first pregnancy served as a preliminary control and the second for a final control group, or for experimental use. Table IV shows several groups compiled from one large group for various control purposes.

Comparison of maternal weight changes should be made between groups of the same pregnancy number. Within groups of the same number the agreement is good. For example, the increases in the mean maternal weight during gestation (day 0-22) for Groups C 22, C 62, C 42, were 72.06, 70.59, 71.80 gm., or 32.5 per cent, 32.3 per cent, and 32.6 per cent, respectively.

Comparisons of litter values are most trustworthy when litters of the same number are considered. For example, the mean weights of the young of the second litters of Groups C 22, C 62, and C 32 were 5.13, 5.12, and 5.14 gm., respectively. However, comparison of the values of the first litter with those of the second may serve as a second check in comparisons of the mean weight of the young. For example, the mean weights of the young of the first litters, Group C 21, and second litters, Group C 22, were 5.06 and 5.13 gm., respectively. Differences of this magnitude, considered statistically, are not significant.

THE EFFECT OF GROWTH HORMONE ON GESTATION AND BIRTH WEIGHT

I. Preliminary Work.—In the preliminary work, growth hormone preparations were administered daily for various periods to 42 pregnant rats with histories of at least one normal litter. Some of the preparations prolonged gestation, interfered with normal parturition, and resulted in stillborn young; other preparations did not exhibit these detrimental effects. The preparations which prolonged gestation did not inhibit the estrus cycle of the normal rat but did tend to prolong the estrus phase. Lactation was not impaired. The preparations which prolonged gestation continued to exert an effect in the subsequent pregnancy. This effect was marked by slight prolongation of gestation, protracted parturition and young of increased size.

Seventeen rats received preparation No. 32 (Phyone, The Wilson Laboratories) from the seventh to the fourteenth day of pregnancy to delivery. This preparation caused prolongation of gestation from two to five days. The mean weight of the young per litter ranged from 5.5

to 7.1 gm. with young as large as 8.6 gm. The young were often still-born and macerated at delivery. Because of the macerated condition of the young, the data on the weights were incomplete and statistical consideration was impossible. Since prolongation of gestation produced by other means has been reported to result in young of increased size no significance has been placed in the increase in weight of young of over-term development. The maternal weight changes were significant but the varying periods of injection made statistical study undesirable. The findings were similar to those reported by Teel, Hain, and Sontag and Munson.

Autopsy or cesarean section was performed on animals treated with preparations which prolonged gestation. One or two days after normal term, the young were often living and were larger than normal; the placentas were slightly or almost completely detached. Autopsy at later times showed completely dislodged placentas, dead fetuses, and marked resorption.

Various preparations made in this laboratory showed that prolongation of gestation with interference with normal parturition was not a property of the growth hormone but of some factor contaminating it. Twenty-five rats received these various preparations but only four of this group which had normal gestation and parturition were injected for periods suitable for statistical study. These are represented as Group E 2 in Tables V and VI. The maternal weight changes were significant. The mean weight of the young per litter was 5.90 ± 0.11 gm. for Group E 2 and 5.12 ± 0.09 gm. for control Group C 62. Statistical comparison of these values gives $P = 0.0005$, a probability of 1 chance in 2,000 that these values could have been obtained by random sampling of the control population.

II. Later Work.—Preparations of growth hormone which did not prolong gestation or interfere with normal parturition are considered in this section. These preparations had no influence upon subsequent pregnancies. In each group the rats weighed 170 to 200 gm. at the beginning of their first pregnancies. The first pregnancy was used for a preliminary control; the second was used for experimental purposes.

Group A.—Eight rats received growth hormone preparation No. 23 (Phyone, The Wilson Laboratories) daily from the tenth or twelfth day of the second pregnancy to delivery. For each rat the mean weight of the young per litter was greater than that of the preceding litter and greater than the mean for either the first or the second litters of the controls.

Four of this group which were injected for comparable periods are considered as Group A 2. The mean maternal weight increase during gestation was 106.13 gm. (46.6 per cent) for Group A 2 and 70.59 gm. (32.3 per cent) for the control Group C 62. The mean permanent gain was 44.40 gm. (19.5 per cent) for the injected Group A 2 and 17.10 gm. (7.8 per cent) for the control Group C 62. The mean weight of young per litter for Group A 2 was 5.70 ± 0.06 gm.; for the control Group C 62, 5.12 ± 0.09 gm.; and for Group A 1 (first litter), 5.18 ± 0.11 gm. Statistical

TABLE V. EFFECT OF PHYONE ADMINISTRATION ON MATERNAL AND NEWBORN WEIGHTS

GROUP No.	PREG- NANCY No.	NO. IN GROUP	ADMINIS- TRATION PREPARA- TION No.	MATERNAL WEIGHT INCREASE			NO. OF YOUNG PER LITTER ± STANDARD ERROR	MEAN WEIGHT OF YOUNG ± STANDARD ERROR	LITTER WEIGHT ± STANDARD ERROR
				DAY 0-52		DAY 0-P.P.			
				INCREASE ± STANDARD ERROR	PER CENT FRMR.	INCREASE ± STANDARD FRMR.			
C 61	1	25	Control	-	-	25.58 ± 2.21	13.7	8.5 ± 0.3	G.M. 5.23 ± 0.02
C 81	1	14	Control	-	-	-	-	8.1 ± 0.3	42.92 ± 1.28
A 1	1	4	Control	-	-	-	-	11.3 ± 0.7	42.67 ± 1.48
B 1	1	10	Control	-	-	31.00 ± 2.78	17.0	8.3 ± 0.4	57.98 ± 3.06
P 1	1	9	Control	-	-	27.43 ± 4.68	14.4	7.6 ± 0.3	42.56 ± 2.50
C 62	2	25	Control	-	-	17.10 ± 2.03	7.8	8.2 ± 0.4	39.68 ± 1.53
C 82	2	14	Control	-	-	-	-	7.6 ± 0.6	41.47 ± 2.03
E 2	2	4	No. 4.2	10.22	92.58 ± 6.23	42.3	35.50 ± 6.73	16.2	5.26 ± 0.12
A 2	2	4	No. 23	10.22	106.13 ± 5.39	46.6	44.40 ± 4.56	19.5	5.90 ± 0.11
B 2	2	10	No. 34	1-22	93.30 ± 4.48	43.1	40.39 ± 4.24	18.7	5.52 ± 0.13
P 2	2	9	No. 34	10-22	94.29 ± 2.57	43.6	46.06 ± 3.65	21.3	5.83 ± 0.10

comparison of the mean weight per litter of Groups A 2 and C 62 gives a probability of 0.009. Therefore the increase in the weight of the young may be considered significant. These values are found in Tables V and VI.

TABLE VI. PROBABILITY VALUES

GROUPS COMPARED	PREGNANCY NUMBER	PHYONE ADMIN.	PROBABILITIES THAT THE DIFFERENCES IN MEANS ARE DUE TO RANDOM SAMPLING					
			MATERNAL INCREASE		NEWBORN YOUNG			
			DAY 0-22	DAY 0-P.P.	NO. OF YOUNG	WEIGHT OF YOUNG PER LITTER	PER GROUP	LITTER WEIGHT
E 2 vs. C 62	2, 2	+, -	0.000,6	0.002	0.12	0.0005	0.000,000	0.003
A 2 vs. C 62	2, 2	+, -	0.000,000	0.000,001	0.05	0.009	0.000,000	0.002
B 2 vs. C 62	2, 2	+, -	0.000,001	0.000,000	0.58	0.01	0.000,000	0.13
P 2 vs. C 62	2, 2	+, -	0.000,000	0.000,000	0.22	0.000,009	0.000,000	0.79
P 2 vs. C 82	2, 2	+, -			0.71	0.002	0.000,000	0.43

Group B.—Growth hormone preparation No. 34 (Phyone, The Wilson Laboratories) was administered daily to 12 rats from the first day to the end of the second pregnancy. Of this group, 1 rat had a litter of 3, 1 went slightly overterm, and 10 are considered as Group B. Pregnancies 1 and 2 of this group are represented as Groups B 1 and B 2, respectively, in Tables V and VI.

The mean weight increase during gestation was 93.30 gm. (43.1 per cent) for Group B 2 and 70.59 gm. (32.3 per cent) for the control Group C 62. The mean permanent increase was 40.39 gm. (18.7 per cent) for Group B 2 and 17.10 gm. (7.8 per cent) for control Group C 62. These increases in maternal weight are significant. They are shown graphically in Chart 2.

The mean weight of the young was 5.52 ± 0.13 gm. for the injected Group B 2, 5.12 ± 0.09 gm. for the control Group C 62 and 5.13 ± 0.08 gm. for Group B 1 (first litter of the experimental group). The increase in the mean weight of the young of the injected Group B 2 over the control Group C 62 was 0.40 gm. (7.8 per cent) and of the injected group over the first litter of the experimental group was 0.39 gm. (7.6 per cent). The increase in the mean weight of the young of the second litter over the first litter of the controls (Groups C 61, C 62) was 0.07 gm. (1.4 per cent). The mean of the weights of the largest newborn rat of each litter of the control Group C 62, was 5.7 gm. and the mean weight of the smallest was 4.4 gm.; in the injected Group B 2 the corresponding values were 6.1 and 4.9 gm. This increase in the weight of the young is of the nature of uniformly larger young. The mean weight of the young for each group has been calculated from the mean weights of the young per litter and also from the individual weights of the young in each group. The significance of the differences in the mean weight of the young of B 2 (injected) and C 62 (control), calculated from the means of the litters, gives $P = 0.01$ and, calculated from the individuals in the group, gives $P = 0.000,000$. This increase in the weight of the young has been considered significant. The values are found in Table V and statistical comparisons in Table VI.

Group P.—Growth hormone preparation No. 34 (Phyone, The Wilson Laboratories) was administered daily to eleven rats from the tenth day to the end of the second pregnancy. Nine of these are considered as Group P; pregnancies one and two are represented as Groups P 1 and P 2 respectively, in Tables V and VI.

The maternal weight change during gestation and the permanent weight change show a significant increase; the mean maternal weight change for Group P 2 during

gestation was 94.29 gm. (43.6 per cent) and for Group C 62, 70.59 gm. (32.3 per cent). The mean permanent gain for P 2 was 46.06 gm. (21.3 per cent) and for C 62, 17.10 gm. (7.8 per cent).

The mean number of young per litter was 7.3 for Group P 2 and 8.2 for the control Group C 62. Consequently, control Groups C 81 and C 82 were selected to fit this experimental group. The mean number of young of Group C 82 was 7.6.

The mean weight of young per litter was 5.83 ± 0.10 for Group P 2, 5.12 ± 0.09 for Group C 62, 5.26 ± 0.12 for Group C 82, and 5.24 ± 0.04 for Group P 1. The increase in the weight of the young of the injected Group P 2 over the control group C 62 was 0.71 gm. (13.9 per cent); the increase over Group C 82 was 0.57 gm. (10.8 per cent); the increase over Group P 1 was 0.59 gm. (11.3 per cent). The increase of the mean weight of the young of C 62 over C 61 was 0.07 gm. (1.4 per cent). The mean of the weights of the largest rat in each litter of Group P 2 was 6.3 gm. and of the smallest, 5.2 gm.; for Group C 62 these values were 5.7 and 4.4 gm. Statistical comparison of the mean weights of the young of Groups P 2 and C 82 gives $P = 0.002$ when calculated from the mean weights of young per litter and $P = 0.000,000$ when calculated from the individual weights of the young in the group. This increase in weight is considered significant.

SUMMARY

1. Control groups have been compiled to show (1) the effect of the number of the pregnancy upon the maternal weight changes during pregnancy and upon the weight of the newborn, (2) the effect of age and suckling upon the weight of the newborn, (3) the effect of the number per litter upon the mean weight of the newborn, and, (4) the effect of the method of breeding upon the mean weight of the newborn.

2. Preparations of the growth hormone of the anterior lobe of the pituitary have been administered daily to pregnant rats for varying periods and in amounts which caused an average daily increase of 1 per cent in nonpregnant rats. Some preparations prolonged gestation, interfered with normal parturition and resulted in stillborn young as reported by other workers. Other preparations did not exhibit these effects. It has been concluded that the growth hormone itself is not responsible for these effects. The increases in the maternal weight changes during gestation were significant. The weight of the newborn young delivered at term was greater in the injected groups than in the control group. These differences, considered statistically, are significant.

I wish to express my appreciation to Dr. Fred L. Adair for his consultation and advice during the course of this investigation.

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HORMONIC INDUCTION OF MENSTRUATION IN AMENORRHEAS OF FROM THREE MONTHS' TO NINE YEARS' DURATION*

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ANY attempt to review the subject of the hormones concerned in the cyclic function of the ovary would necessitate a bibliography that extends into the hundreds or more of monographs and reviews on the subject, consequently citations will be restricted to those subjects which are intimately related to the administration of the hormones concerned in the text.

Allen and Doisy¹ in 1922 and 1924 applied the rodent vaginal smear studies of Stockard² (1917) to determine the presence of the female sex hormone and to standardize it. Butenandt³ in 1929 and others isolated the female sex hormone in the pure crystalline state and determined its chemical formula.

Dodds and Robertson⁴ in 1930 administered 10 M.U. of the female sex hormone daily to a series of cases for a period of three months and concluded: "The results do not at first sight indicate a very hopeful outlook for the use of this substance. Out of 80 odd cases treated, only 30 showed definite objective improvement, although practically all of them showed general improvement. . . . Much larger doses of the substance must be given before it is put aside as useless. A large series of cases should be treated with 50-100 units per day and with this very definite results might be obtained and many hundred units in a single dose will have to be tried before a definite answer can be given."

Parkes⁵ in 1932 prophesied on a weight for weight basis that the human castrated female of 50 kg. would require 400,000 M.U. to induce a similar physiologic state as was induced in the experimental animal. This figure would not produce uterine growth in the human being.

Zondek in 1927 revealed the urine of pregnancy as a rich source of the female sex hormone; this opened up the field of research and made possible the work of Hildebrandt and Schwenk⁶ in 1933 who, by a process of hydrogenation of the ketohydroxyestrin, were able to increase the estrin units in a gram from 8 to 30 million; thereby providing the large unit dosage. A later development from the same laboratory was the benzonation of the female sex hormone which permitted its gradual utilization by the body, in effect producing an "artificial ovary."

Mazer in 1933 determined that the benzonated hormone was excreted in the urine at a certain rate and was present in the urine on the fourth day following injection. His work was of great assistance and assurance to me in this study.

Zondek⁷ in August of 1934 supplied the reason why results in the past were so baffling and discordant. He injected a total of 540,000 M.U. of follicular hormone into a (human) female and could only recover 3 per cent from the urine in fifteen days. In a human male he recovered only 5 per cent in ten days, following a single injection of 40,000 M.U.; and in a rat injected with 20,000 M.U. in a single dose

*Read, by invitation, at meeting of the Obstetrical Society of Philadelphia, January 3, 1935.

he obtained negative recovery from the urine. Zondek then injected similar large doses into a rat and killed it within three hours and extracted the whole animal and recovered less than 1 per cent; however, when he subjected the extracted material to hydrogenation he recovered 20 per cent of the female sex hormone. This conclusively demonstrated that the crystalline follicular hormone was rapidly inactivated in the body following its injection. Conducting similar experiments with the benzonated female sex hormone he found that it was not inactivated in the body of the rat.

The rôle of the anterior pituitary on the cyclic activity of the ovary is so well known that to state that it is the motor of the ovary appears sufficient.

Amenorrhea is of interest to the obstetrician and the gynecologist from a diagnostic as well as a therapeutic viewpoint. It is associated with constitutional and endocrine states, therefore therapy in amenorrhea is contingent upon the etiologic factor. The endocrine glands concerned in amenorrhea are the thyroid, the adrenal, the pituitary, and the ovary. Hyperfunction of the first two glands and hypofunction of the last two generally result in amenorrhea.

Kauffmans and Loeser⁹ in 1933 demonstrated that by giving a series of injections of the benzonated female sex hormone (Progynon B) and then following with a series of the lutein hormone, that menstruation could be induced in the old and recent castrates. Kauffman¹⁰ in 1934 has also administered large doses of the benzonated female sex hormone in cases of secondary amenorrhea and has induced menstruation.

In the cases to be reported we were dealing with a clinical syndrome that was a primary state to the patient and the amenorrhea was a secondary clinical phase. It was our belief that a deficit of the female sex hormone in the blood was the major factor responsible for the primary clinical state in four of the cases. The induction of menstruation was a secondary effect from the therapy, our prime purpose was to relieve the symptom complex.

CASE REPORTS

CASE 1.—Single, aged forty-two years. Type: nonobese, hypopituitary. Amenorrhea of three and one-half months associated with involutional melancholia.

Clinical Symptoms: Irritability, depression, psychic instability, self-destruction ideas, neuritis and weakness of upper extremities, headache, nausea, and vomiting.

Menses: Onset at fourteen years of age, regular, two days' duration and of scant amount. Aggravation of early migraine symptoms as menses diminished. Melancholia appeared with onset of amenorrhea in June, 1934.

Genitals: Labia small, uterus of the juvenile type, characterized by a long cervix and short body. The ovaries were small, hard and insensitive to firm palpation.

Therapy: One cubic centimeter of anterior pituitary liquid (Armour) every fifth day. (Previous ten weeks similar therapy without change in menses.) 10,000 R. U. progynon B (Benzonated female sex hormone*) weekly with an occasional dose for early clinical symptoms.

*I am indebted to Dr. Gregory Stragnell of the Schering Corporation for the supply of progynon B employed in this study.

Results: Menses began on September 12 and lasted five days with a good flow. Increase in the size of the uterus. Disappearance of melancholia and associated symptoms.

CASE 2.—Single, aged twenty-nine years. Amenorrhea of one year associated with obesity (186 pounds) of the hypopituitary type. The general body physique was short with the obesity existing about the trunk and with slight extension into the extremities. There was hyperextension of the elbows and a hard palatal deformity. The skin showed a tendency to purpura on slight blows.

Clinical Symptoms: Obesity began at the age of twenty years. During last two years she gained from 15 to 20 pounds. During the last year she has had headaches, nervous and vertigo spells, which last for two days each month.

Menses: Onset at the age of eleven years, irregular, duration two to three days and scant in amount. Last menses: October, 1933.

Rectal Examination: Uterus of the juvenile type and the external genitals were small. The breasts were large and pendulous but were chiefly fatty tissue.

Laboratory: Normal cholesterol and basal rate of minus 23. The patient, a nurse, stated that she had previously been given the following therapy for amenorrhea: 1 c.c. of antuitrin-S daily for four months, next two months antuitrin-S 1 c.c. daily and thyroid $\frac{1}{4}$ grain t.i.d., next two months theelol capsule 1 t.i.d. and then 2 t.i.d., and the last therapy was antuitrin-S and ovarian substance 1 c.c. of each every second day for three months.

Therapy: On Nov. 3, 1934 she was put on the following therapy: 2 c.c. of the anterior lobe of the pituitary liquid every other day and 2,000 R.U. of progynon B every third day. She menstruated for the first time in over a year after one month of therapy on Dec. 8, 1934. Menses lasted seven days and were of moderate amount.

CASE 3.—Aged thirteen years. Onset of illness August, 1933. Amenorrhea of one year's duration associated with Simmond's disease.

Clinical Symptoms: Loss of weight of 52 pounds, hypotension, systolic pressure 75, diastolic pressure 50, vertigo, extreme mental and physical weakness, coldness of the extremities, melancholia, irritability, emotional outbreaks, rapid progression of symptoms, senile appearance, atrophy of the breasts and uterus.

Menses: Onset at the age of eleven and one-half years, regular, five days' duration and normal amount. Last menses: Aug. 16, 1933, aged twelve and one-half years.

Rectal Examination: Unsatisfactory, vaginal examination was required for differential diagnosis. Vaginal examination: uterus was markedly atrophic, felt as a small cylindrical mass and anatomical parts could not be differentiated. Vaginal cavity: mucous membrane dry.

Laboratory: X-ray of the chest and the Mantoux test negative. X-ray of pituitary fossa, negative. Mild degree of anemia. Basal metabolism rate minus 3.

Therapy: Two cubic centimeters of the anterior lobe of the pituitary (Armour) daily except Sunday and 10,000 R.U. of progynon B weekly for a period of three months. Progynon B continued weekly and the anterior lobe of the pituitary was gradually reduced to 2 c.c. weekly.

Results: Vaginal discharge began after the third week and appeared about twelve hours after each administration of progynon B. The discharge became more profuse and thickened and finally was bloody for four days (Aug. 16, 1934). Vaginal examination was made on August 16, and it was found that the uterus had increased in size about 300 per cent and the anatomical parts were now palpable.

Menses occurred the evening of the sixteenth and lasted one day followed by two days of bloody discharge; the next menses occurred October 1 and lasted three days, fair flow. Third period occurred on October 30 and lasted one day with two days of bloody discharge.

Her general improvement was evidenced by a normal mental state, gain in over 30 pounds, normal blood pressure, the hypertrophy of the breast and enlargement of the uterus.

CASE 4.—Married, aged forty-three years. Type: nonobese hypopituitary. Amenorrhea of nine years associated with status migraine.

Clinical History: Hypomenorrhea, hypogenitalia and sterility for twenty years. Migraine syndrome: thirteen years in monthly cycles. Menopause at thirty-four years, hot flashes, lack of libido, atrophy of the breasts.

Laboratory: Blood: female sex hormone, negative throughout the month. Anterior pituitary hormone positive throughout the month. Basal metabolism rate plus S. Blood chemistry, negative: Wassermann, negative.

Therapy: From June 22 to 29 she was given 160,000 R.U. of progynon B. In July, breast hypertrophy was evident. From July 27 to August 3 she was given 210,000 R.U. of progynon B with excellent clinical results. Four days later she had her first menstrual period in nine years and it lasted ten days. The breast hypertrophy was maintained. From September 1 to 6 she was given 400,000 R.U. of progynon B. On the seventh and last day she was given 90,000 R.U. to abort the attack which by its severity and course indicated a fifteen-day attack. (She had a 21-day attack in April, 1934.)

The breasts were hypertrophied to a degree that objectively and subjectively they were comparable to the postpartum engorged breasts, and consequently administration of the progynon B was stopped. The attack was aborted but residual symptoms persisted for seven days at which time the second menses came on and lasted five days and were of good amount. Although the patient experienced these attacks at least monthly she did not have an attack for seven weeks; in the meantime the breast hypertrophy had practically disappeared.

From October 21 to 26 she was given 280,000 R.U. of progynon B and a third menstrual period occurred five days later and lasted for ten days; however, the bleeding was intermittent after the fifth day.

Results: Three consecutive periods in a case of amenorrhea of nine years' duration. There were no toxic effects from the administration of 1,126,000 R.U. of progynon B in a period of one hundred and twenty-eight days. Single daily doses as high as 90,000 R.U. were given. Breast hypertrophy. Vaginal examination in November, 1934 revealed a normal sized uterus for her age of forty-three years. Clinical improvement and occasional control of symptoms.

CASE 5.—Married, aged twenty-six years. Amenorrhea of five and one-half months associated with a basophilic adenoma of the pituitary.

Clinical Symptoms: Obesity, regional; hypertrichosis, hypertension, headache, neuritis, pigmentation and striae, uterine hypoplasia and cystic ovaries. Optic changes. Abnormal growth of hair began at the age of thirteen years.

Menses: Onset at sixteen years, irregular, and lasted from one to three days and of diminished to scant amount. Pregnancy 1932; obesity began following pregnancy.

Laboratory: Wassermann and blood chemistry: negative. Basal metabolism rate plus 18. X-ray of pituitary: slight enlargement.

Therapy: Dosage of progynon B, 2,000 R.U. at variable periods depending upon clinical signs. Menstruated for one day on Oct. 26, 1934. Large dosage 5,000 to 10,000 weekly began in November and was increased to twice weekly with appear-

area of vaginal discharge. This patient was given from December 11 to 27 a total of 80,000 R.U. of progynon B. No menses occurred and she was given 10 rabbit units of the luteohormone on December 29. Menses occurred on Dec. 31 and were still evident on Jan. 2, 1935 and the amount was of fair flow.

COMMENT

In the cases reported we were treating essentially a clinical syndrome; the failure of the ovarian function as well as altered function of the pituitary gland was an integral part of all. The pathology of the pituitary gland varies; in Simmond's disease we have atrophy, in the basophilic adenoma we have an adenoma of the pituitary gland and hyperplastic or adenomatous changes of the adrenal, in the status migraine and the involutional melancholia we have a pituitary gland which, to my way of interpreting the state, is secreting gonadotropic hormones but fails to find a receptive substance from or in the ovary, therefore we have a piling up of the prolans in the blood stream. In the case of amenorrhea and obesity we have a hypofunction of the pituitary.

In the case of the involutional melancholia, previous administration of the anterior lobe was not sufficient to improve the menses, but the addition of the progynon B brought about the first normal period.

In the hypopituitary obesity case, pituitary and pituitary-like preparations had been tried with no effect and the addition of the female sex hormone brought about menses. In the case of Simmond's disease the effectiveness of this combination is again manifested and it appears that it materially reduced the quantity of the benzonated female sex hormone required to be administered.

In the case of the basophilic adenoma we are confronted with a pituitary gland that we know to be in a state of basophilic hyperfunction, further they may give a positive pregnancy test.¹³ It is a dangerous state and therefore the administration of the pituitary is contraindicated. The administration of progynon B for the associated clinical symptoms, however, produced menses after an amenorrhea of five months.

In the status migraine our blood determinations had shown that there was an excess of the prolano factor. This is a problem case and, as the work of Mazer had shown that elimination was rapid, I felt justified in pouring in the benzonated sex hormone. Furthermore, during pregnancy large amounts are tolerated. I believe that it demonstrated its clinical value, but there eventuated a series of phenomena following the administration of the large dosage. First breast hypertrophy, then the first menses in nine years for a period of ten days, the further administration in larger dosage, 400,000 R.U. brought about intense hypertrophy of the breast and a second menses. There then followed an unusually long interval between attacks (seven weeks) during which the breast hypertrophy practically disappeared. This event causes us to consider the recent finding of Dean Lewis,¹¹ that in a fibroadenoma of the breast,

assay of the tissue for the female sex hormone showed it to contain much greater concentration per gram than the ovary. The question then arises, is the breast capable of storing the female sex hormone? From my experience in this case and in others I would answer in the affirmative. This is especially suggestive in the case of a male to whom the progynon B was given for a typical migraine with left-sided hemianopia. He developed pain in the nipples, and breast tissue appeared in the region of the left nipple following the administration of 30,000 R.U. of progynon B. In these two specific instances the attacks did not occur while the breast enlargement was evident.

Ingleby¹² in 1932 showed that both the normal breast and benign pathology of the breast undergo a sexual cycle, and we know that lack of ovarian stimulus causes atrophy to occur.

The concluding thought on this particular phase is that in cases of severe ovarian deficiency the therapy should be pushed until there are hyperplastic changes in the breast, because we know then that the blood content of the follicular hormone should be in the normal physiologic levels.

CONCLUSIONS AND SUMMARY

The benzonated female sex hormone (progynon B) when administered in sufficiently large dosage will produce menstrual bleeding in an amenorrhea of nine years' duration.

The administration of the benzonated female sex hormone combined with the anterior lobe extract, is effective in inducing menstruation in certain amenorrhées of one year's duration even when associated with progressive and extreme atrophic states of the ovaries and uterus such as is found in Simmond's disease.

The benzonated female sex hormone induced hypertrophic changes in hypoplastic uteri and breasts.

The benzonated female sex hormone is nontoxic in extremely high single and accumulative dosage.

The benzonated female sex hormone controls the melancholia associated with hypoovarian states and is also effective in migraine irrespective of sex.

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AN ANALYSIS OF 381 CESAREAN SECTION CASES IN A TEN-YEAR PERIOD AT MICHAEL REESE HOSPITAL*

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IN VIEW of the existing enthusiasm over low cervical cesarean section, in 1927 the attitude of the obstetric staff of Michael Reese Hospital toward abdominal delivery changed abruptly. Prior to this period, cesarean section was performed in less than 1 per cent of our cases. After a two-year trial of the low cervical technic our indications were greatly broadened and consequently the operative incidence increased. We, therefore, have selected for analysis and study the two five-year periods just prior to and immediately following the change. The results of the first 40 low cervical operations performed by the authors were reported before this society in 1927.¹ In that series there were no maternal deaths. Encouraged by our results, and the satisfactory experience of other members of the obstetric staff, we felt justified in extending our indications, hence the material increase in incidence of cesarean section in the next five years. That this increase was justified will be shown in the comparative analysis which is embodied in this report. The mortality from the operation of cesarean section in our series was strikingly reduced by improvement in operative technic and in anesthesia. The operations herein reported were performed by eleven operators, most of whom were on the regular obstetric service at the hospital. Fully three-fourths of the operations were performed by the four obstetricians comprising the present attending staff. Three of these hold university professorial positions in the medical schools of Chicago (Rush), Northwestern, and Illinois.

INCIDENCE

There were 381 cesarean operations of all types among 15,136 cases, an incidence of 2.52 per cent for the ten-year period, 1922-1932. In the first five-year period, the incidence of section was 0.91 per cent and in the second, 3.79 per cent. Approximately 20 per cent of the sixty-one cases in the first period were classical sections, while in the second period, the incidence of the latter dropped to 8 per cent, and transperitoneal cervical operations rose to 90 per cent of the 320 cases. There were but five Porro cesareans, all in the second period. Our general incidence of cesarean section is comparable to that of many of the larger obstetric services as reported in the literature. The Chicago Lying-In Hospital incidence for the years 1915-1929, as reported by Greenhill, was 2.06 per cent,² and that collected by E. v. Ammon³ during approximately the same period, representing the contributions of thirty-five authors, ranged from 0.04 per cent to 17.27 per cent, with an average of 1.66 per cent.

*Presented at a meeting of the Chicago Gynecological Society, February 15, 1935.

During the years 1926-1930 inclusive, the transverse incision (Kerr⁴) of the lower uterine segment was performed by us in eighty-four of the 271 low cervical operations. This technic was then discarded as we believed that it offered no special advantage over the longitudinal incision, and that it left a decidedly weaker scar in case of future pregnancy. While we encountered no actual ruptures in this group, several cases of a weak or thin scar were observed at the time of repeated cesarean section. The difficulty appears to be that the upper flap of the transversely incised segment retracts and becomes a thick edge which, when united to the thin lower edge, does not result in perfect approximation.

INDICATIONS

Dystocia, contracted pelvis, and previous pathologic labor appear as the leading indications in the ten-year period. The listing of indications into tables representing the two five-year periods makes obvious the fact that the increase in cesarean sections depended to a great extent upon the broadened indications in relation to *toxemia, repeated cesarean sections, sterilization, and organic heart disease*.

Test labor in most instances determined whether or not dystocia obtained, and the criteria of test labor varied more or less with the different operators. As we previously stated,¹ "What constitutes an adequate test of labor is a matter of dispute and must be decided after a careful study of each individual case." Our inclination at the present time is to limit rather than to extend the hours of trial labor. Forty-seven patients in this series were allowed to labor from twenty-five to sixty-seven hours before deciding upon abdominal delivery. We now believe this to be entirely too long a test. Many of these patients were also listed in the group of contracted pelvis. We no longer rely upon mensuration as the all-important criterion in determining the indication for section in contracted pelvis, but study the degree of disproportion by clinical and roentgenographic methods, and suitable instances, we permit a reasonable test of labor. We do not believe that the patient should be subjected to an ordeal resulting in utter exhaustion of the mother and jeopardy to the child in order to conform with a preconceived idea, that if given sufficient time, 75 per cent of women with moderately contracted pelvis will deliver from below.

In the group listed under *previous pathologic labor*, elective cesarean section was decided upon in such cases as *previous third-degree tear during a forceps failure and craniotomy*, and in cases of *repeated stillbirths*. In others, with a history of long labors with living children, test labor was permitted. The question of indications in cases of previous cesarean operations was also individualized. When one or more sections had been performed upon a patient, and sterilization was requested or advised, elective repeated section was performed. When the first section was performed for a complication which did not appear in the next labor, or was done after but a brief test labor, providing the convalescence from previous section was uneventful, test labor was allowed before deciding upon the repeated operation. *Sterilization* was secured chiefly by means of two methods, namely: cornual excision of the interstitial portion of the fallopian tubes, and by the Walthardt modification of the Madlener technic of tubal ligation.¹¹ In our series, sterilization was indicated in twelve patients with organic heart disease and was usually done with the advice of the medical consultant. In many of these patients, the cardiac condition coupled with the desirability of sterilization furnished a combined indication for abdominal delivery. In case of repeated cesarean operations, the desires of the patient and her husband were taken into account in arriving at a decision to sterilize. In all cases, both husband and wife were required to give written consent for the operation.

In regard to the indications for cesarean section in *abruptio placentae* and *placenta previa*, no explanation is needed except in the lateral and marginal types

of previa. When the cervix is unefaced and not dilated in the primipara with placenta previa, cesarean section offers the quickest and safest method of delivery for both mother and child. At or near term, the low cervical technic is preferable. In the second five years in this series, five multiparas were operated upon for lateral or marginal placenta previa. One of these patients should definitely have been treated by other methods, a para x with nonviable twins. In the analysis of maternal deaths, this case furnishes a mortality.⁹

That a great increase in incidence of cesarean operations occurred in the group of women with *toxemia* is designated: there were four in sixty-one cases in the first five years, and fifty-seven in 320 cases in the second. There is no doubt in our minds that in nonconvulsive toxemia of the severe type which does not respond to controlled management, pregnancy should be terminated. Low cervical section under local anesthesia is the method of choice of the authors for primiparas in this group, and is extended to some multiparas in whom induction of labor is inadvisable. Fifty-two patients in this group were operated upon for nonconvulsive toxemia with no maternal and only two fetal deaths. Both of these babies were premature and died from atelectasis.

According to Stander,⁵ 25 per cent of the 17,000 women who die in the United States as a result of childbirth each year, die of toxemia. Holland⁶ reported a maternal mortality of 39.3 per cent in 231 cases of toxemia (including eclampsia), and a fetal mortality of 46.9 per cent. Gordon,⁷ found a maternal mortality in Brooklyn of 16.2 per cent and a fetal mortality of 21.9 per cent in 210 cases of toxemia. In our series, there were sixty-one cases of both types operated upon with two maternal (3.28 per cent) and five fetal deaths (8.19 per cent), all prematures.

It is the policy of the obstetric staff of Michael Reese Hospital to select abdominal delivery for the nonconvulsive type of toxemia but not for eclampsia. However, there were nine patients with convulsive toxemia operated upon in the ten-year period with one maternal and three fetal deaths.

MATERNAL MORTALITY

In the decade, 1922-1932, in which 381 cesarean sections were performed, there were nine maternal deaths, a gross mortality of 2.36 per cent. Eight of these deaths are justly chargeable to the mode of delivery, while Case 2, in which an attempt was made, at the request of the husband, to obtain a living child from a woman moribund with pneumonia, is rightfully eliminated. By subtracting this one death, our corrected mortality is 2.10 per cent. This figure practically corresponds to our total mortality in low cervical cesarean section (2.08 per cent). This percentage of mortality compares favorably with v. Ammon's summary (thirty-five authors) in which there were 222 deaths in 5,365 transperitoneal sections with a gross mortality of 4.14 per cent and a corrected mortality of 2.14 per cent. The corrected mortality (v. Ammon) for classic section was 2.60 per cent and for the extra-peritoneal technic, 3.61 per cent.

According to Plass,⁸ the general maternal mortality from cesarean section is 5 to 10 per cent, and in the above-mentioned compilation (v. Ammon), the general mortality in cesarean sections is 5.76 per cent and corrected, 2.67 per cent. Holland's average mortality in 1,954 operations (1910-1920) was 4.3 per cent.

FETAL MORTALITY

Three hundred and eighty-five babies were delivered by cesarean section, including four sets of twins, from 381 mothers. Two sets died, the first in a case of abruptio placentae, and the second were nonviable twins in a case of placenta previa. Of the two sets which survived, one was in a patient with eclampsia and the other in a

patient with organic heart disease. The total number of fetal deaths was nineteen, a gross mortality of 4.93 per cent; corrected, 2.33 per cent. The following ten cases were deducted in computing the corrected mortality:

1. 1922: Antenatal death—Transverse presentation, membranes ruptured; previous interposition operation.
2. 1922: Intrapartum death, dystocia; heart tones heard just prior to surgical preparation for section; stillborn full-term fetus.
3. 1927: Premature (six and one-half months) nephritic toxemia.
4. 1928: Stillbirth in patient moribund with pneumonia.
5. 1929: Premature (1,215 gm.) with atelectasis toxemia.
6. 1929: Premature (996 gm.) toxemia.
7. 1929: Premature (635 gm.) severe nephritic toxemia.
8. 1930: Anencephalic monster, previous cesarean section, sixteen-hour test labor.
- 9 and 10. 1931: Premature twins (six months), placenta previa.

The published fetal mortality in the period covered by this study varies somewhat. Thus, v. Ammon in his general summary, reported a 9.3 per cent gross and 3.95 per cent corrected fetal mortality in 7,287 births; Constantinesco, 18.7 per cent in classic and 6.3 per cent in low cervical section; Welz (1925), 11 per cent and Seeley (1930), 12.8 per cent, both from the city of Detroit; and Greenhill, 4.5 per cent from the Chicago Lying-In Hospital. Thus, the fetal mortality of 2.33 per cent in this series appears favorably low.

MATERNAL MORBIDITY

The morbidity in cesarean section is generally high, and in our series was 36.48 per cent. Eighteen different complications occurred in 139 patients, and uneventful recovery obtained in 242. The vast majority of complications occurred under the first five headings, conditions which, for the most part, did not threaten the life of the patient. The serious and even fatal complications such as sepsis, peritonitis, evisceration, and pulmonary embolus were but rarely encountered. The factors which we believe have an important bearing upon the chief morbid conditions observed in our series are as follows:

Abdominal distention occurred with much greater frequency when general anesthesia was used than with local, and most often with ethylene. There apparently was no relationship between distention and the state of the membranes, for in eighty-three cases, the membranes were ruptured for an average of fourteen hours before section was performed. Distention was noted in 19 per cent of the latter and in about 18 per cent of patients with intact membranes. Test labor likewise was of little significance, for in about 16 per cent of cases with labor (average, twenty-eight hours) and 20 per cent without labor, abdominal distention occurred. There was no difference in incidence of distention in patients after low cervical and classic cesarean section (18 per cent).

Pyelitis occurred two and one-half times as often with general as with local anesthesia, and most frequently with ether (15.9 per cent). It occurred twice as often after the membranes had ruptured for an average of twenty-three hours, and 50 per cent more frequently after test labor. It was decidedly more frequent after the low cervical operation for obvious reasons. First, the bladder is more or less completely detached from the lower uterine segment during the operation; and second, catheterization is more frequently done as a routine. The bladder is usually emptied every eight hours postoperatively, and frequently the catheterization is done on the same patient by two or three different student nurses.

Wound infection occurred approximately in the same percentage of patients with ether, ethylene and local anesthesia, but was slightly less frequent with local than

with ethylene; this is contrary to the general belief, that local infiltration favors wound infection. It was three times as frequent when the membranes were ruptured for an average of twenty-five hours as when they were intact, and twice as often in patients with an average test labor of twenty-five hours as in elective section. Probably the latter factors were also operative in the greater frequency of wound infection in low cervical as compared with classic cesarean section, for the latter was an elective operation as a rule.

Sapremia occurred twice as often after general as after local anesthesia, and most frequently after ether. In patients who were permitted labor (average, twenty-

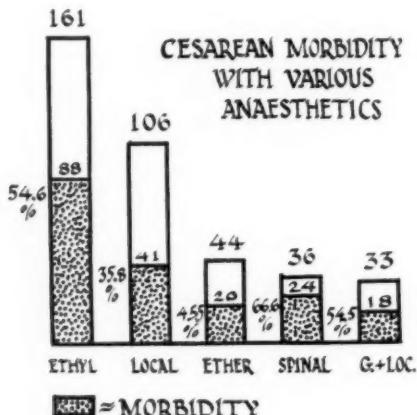


Fig. 1.—Morbidity chart.

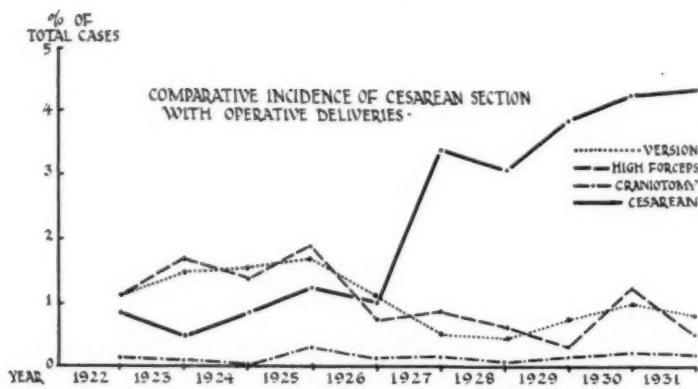


Fig. 2.—Comparative incidence.

seven hours), *sapremia* occurred twice as often as those operated upon before the onset of labor, and as with wound infection and pyelitis, a greater incidence of *sapremia* occurred after low cervical section.

Respiratory infections were entirely absent in the patients operated upon under local anesthesia and occurred with greatest frequency after ether anesthesia (6.28 per cent). They were more frequent, though few in number, in patients with ruptured membranes; in the patients with test labor they were less frequent. There were no respiratory infections in the 39 patients in whom classic cesarean was performed and but 3.23 per cent in the 337 patients with low cervical cesarean.

Fig. 1 illustrates graphically the general relationship of anesthesia to morbidity in our series. The lowest morbidity occurred with local infiltration and block, and the highest with spinal anesthesia. The addition of inhalation anesthesia to local anesthesia apparently increased the morbidity to the level of the general anesthesia group.

COMMENT

As will be observed from the accompanying graph (Fig. 2), when our cesarean incidence increased, there was a 50 per cent decrease in versions and high forceps operations. Craniotomies constituted a small but constant incidence throughout the decade. We are in full agreement with the conclusions of Baer, Reis and Lutz that the decrease of 50 per cent in the incidence of versions is not entirely justified, while that of high forceps is fully warranted. When we attempted to compare the morbidity from these three groups of operative deliveries, we encountered considerable difficulty in placing the correct evaluation upon significant factors. The conditions under which the operations are performed are frequently dissimilar, and the prerequisite conditions for one type of operation may entirely exclude the other. To obtain a proper perspective of the three competing operations, we have taken into account not only complications which we encountered, but have also included the gross maternal and fetal mortality. Thus, our gross maternal mortality from version during ten years was 3.24 per cent, high forceps, 0.67 per cent, and cesarean section, 2.36 per cent. The gross fetal mortality was 17.28 per cent in version, 8.13 per cent in high forceps, and 4.92 per cent in cesarean section.

That our choice of operative procedure in some instances might justly be criticized is realized as we look back over our results. In the group delivered by version and extraction, there were 42 primiparas and 11 patients in whom the membranes were ruptured for more than twelve hours. Among these, there were undoubtedly some who might more judiciously have been delivered by abdominal section. On the other hand, the patients with partial placenta previa and those with eclampsia who were delivered by section might have been delivered vaginally in strict accord with our policy, and with more favorable results.

It has been the policy of our staff to obtain a fetal roentgenogram before performing cesarean section to study the fetal development and pelvic disproportion, and also to detect fetal monstrosities and multiple pregnancy which may have gone unrecognized clinically. In many emergent conditions, however, the x-ray examination was omitted. Furthermore, due to economic conditions, many patients objected to the added cost of this type of examination as they believed it to be non-essential. In 73 patients (19 per cent) in our series, roentgenograms were obtained before abdominal section. Had routine roentgenograms been made, vaginal delivery might have been chosen in two cases of twins and unquestionably in the case of anencephaly referred to above.

CONCLUSIONS

1. Cesarean section has taken an increasingly significant place among the operative procedures in the Michael Reese Hospital maternity.
2. The adoption of the low cervical technic is chiefly responsible for the extended indications and consequent increased incidence.
3. The maternal mortality from cesarean section in the ten-year period was 2.10 per cent and the fetal mortality was 2.33 per cent. These results compare favorably with the published statistics covering the same period.
4. Analysis and study of the postoperative complications yield some valuable information concerning the morbidity, but is of little assistance in determining a choice between vaginal and abdominal delivery.
5. The advantage of local over other forms of anesthesia is demonstrated by the analysis of morbidity. The highest morbidity occurred in the group operated upon under spinal anesthesia.
6. Comparative and combined maternal and fetal mortalities indicate that in our hands, cesarean section is safer than version and high forceps. We do not recommend the replacement of version by cesarean section, however, in cases that present valid indications and prerequisite conditions for the operation of version and extraction.

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Brown, T. K., et al.: Pyridium in the Treatment of Gonorrhoeal Vaginitis in Children, J. Missouri M. A. 31: 313, 1934.

The authors report the results obtained in 21 children between the ages of two and ten years who have remained cured at least 6 months after cessation of treatment. The treatment consists of a vaginal suppository of 0.16 gm. of pyridium in boroglyceride of gelatin base inserted every night followed by a 500 c.c. of 1:1,500 KMnO₄ douche via Dakin tube under very low pressure every morning. Under such a regime the duration of treatment has been reduced gradually so that with a cooperative family the average treatment extends from four to eight weeks.

J. THORNWELL WITHERSPOON.

PORRO CESAREAN SECTION*

AN ANALYSIS OF 53 CASES: SIGNIFICANCE OF INDICATIONS

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EDOARDO PORRO of Pavia suggested amputation of the uterus following cesarean section in 1876 to overcome the high mortality (40 to 62 per cent). In the next twenty-five years the mortality dropped to 24.6 per cent, due to the decreasing incidence of infection following the introduction of antisepsis and asepsis. With further improvement in the technic of the cesarean operation, the Porro method has been employed only occasionally since it sacrifices the uterus. But though its field of usefulness has become narrowed it may be still the procedure of choice or necessity under certain conditions. The original technic has been modified so that only a supravaginal hysterectomy is performed, although the name is retained.

The indications recognized today are:⁵ Intrapartum infection when vaginal delivery is not possible; fibroids, especially when they are obstructive; uterine hemorrhage which appears uncontrollable after a cesarean section for a premature separation of the normally situated placenta or placenta previa; rupture of the uterus; uncontrollable postpartum hemorrhage; placenta accreta; carcinoma of the cervix and osteomalacia. In addition to the above, we wish to emphasize the following indications, namely: combinations of above conditions, pulmonary tuberculosis, chronic nephritis, and sterilization.

The statistics of the fifty-three patients operated upon in the Obstetrical Department of the Cook County Hospital for the five-year period 1930 to 1934 are given in Tables I to V.

TABLE I

Race	White	26					
	Colored	27					
Age	19-20	21-25	26-30	31-35	36-40	41-45	46-48
	2	4	14	9	12	10	2
Para	0	i	ii	iii	iv	v	vi
	3	6	6	3	4	5	7
					6	6	xviii
						ix	x
						1	4
						xii	1
							1

The Porro cesarean section performed in a multiparous woman past thirty-five years of age requires a single indication, but in a younger woman with one or no children the indication must be that of life

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TABLE II. INDICATIONS FOR PORRO CESAREAN SECTION IN 53 PATIENTS

PRIMARY	ASSOCIATED PATHOLOGY OR ADDITIONAL INDICATION	TOTAL
Placenta previa centralis	Fibroids 2 Preeclampsia, sterilization multiparity 1 Multiparity 1	4
Premature separation of the normally situated placenta	With couvelaire uterus 8 With intrapartum infection 2 Multiparity, sterilization 2	12
Disproportion	Long labors, ruptured membranes 5 Previous cesarean sections, sterilization 3 Intrapartum infection 1	9
Preeclampsia	Intrapartum infection 3 Sterilization, multiparity 3 Feeble-mindedness 1	7
Chronic nephritis	Preeclampsia superimposed, sterilization 5 Fibroids 1 Placenta previa 1	7
Pulmonary tuberculosis	Sterilization 3 Pott's disease, sterilization 2	5
Ruptured uterus	Ruptured membranes, 18 hours, multiparity 1	1
Threatened rupture of uterus	Live baby; attempts at delivery at home	
Neglected face presentation	Membranes ruptured 24 hours; labor 60 hours	
Prolapsed uterus and vagina	Intrapartum infection 1	1
Sterilization for abnormal mentality	No dilatation; strong labor pains 6 hours 48 years old, para ix	1

TABLE III. OPERATIVE PROCEDURES IN THE 53 PATIENTS

Classical cesarean section	15
Low cervical cesarean section	28
Subtotal hysterectomy	
After removal of child	46
Before removal of child	6
Complete hysterectomy	1
Salpingectomy	
Unilateral	3
Combined with oophorectomy	4
Bilateral	2

TABLE IV. MORBIDITY

Fever before operation	7
Fever after operation	
100° F. and above after first postoperative day	37 69.8 per cent
Bag induction attempted	2
Membranes ruptured 12 to 72 hours	10
Labor present from 6 to 60 hours	20
Wound infections	12

TABLE V. MORTALITY IN THE 53 PATIENTS

Maternal	6	11.3 per cent
Fetal		
Before operation	19	35.8 per cent
After operation	3	5.7 per cent

preservation. The operation is not complicated, not time consuming and is usually followed by a smooth convalescence. Its greatest objection is that it sacrifices the uterus in the childbearing period and atrophy of the ovaries may follow five to eight years later. In our series the two women under twenty years of age, had, respectively, a ruptured and an infected uterus with a live baby in malposition. In the other young women combinations of conditions were present to demand the radical operation. Such combinations as placenta previa centralis and fibroids, chronic nephritis and fibroids require no detailed discussion as they are generally accepted.

Since tuberculosis is aggravated during menstruation and the puerperium, it was considered logical to eliminate these physiologic states by removing the uterus in those women in whom childbearing was contraindicated. Further, we utilized Petersen's work as a basis in attempting to decrease the capillary permeability by administering pituitrin in oil intramuscularly or intranasally for the first ten post-operative days. The reason for attempting to decrease the capillary permeability is to decrease the action of the proteolytic enzymes on the tuberculous lesions. These enzymes are in the blood during the puerperium and may break down the healing processes around the tubercle bacillus. All of the five tuberculous patients were operated under local anesthesia and all made smooth postoperative recoveries. There were only temporary rises in temperature in the first few post-operative days. All these women were sterilized on recommendation of medical consultants. Therefore, the function of the operation in tuberculous women is not only to sterilize when the condition warrants it, but also to eliminate the involution phenomena and future menstruation.

In chronic nephritis, we felt that by removing the uterus the load on the kidneys with lowered functional capacity was decreased. With involution there is an increase in nitrogenous end-products in the circulation due to the breaking down of the uterine musculature by autolytic processes. Slemmons⁶ showed that the characteristic increase in nitrogen output was lacking after a Porro cesarean section. In the experience of one of us (A. F. L.) a patient was observed to pass into a moderately severe uremia after delivery. Therefore, the value of a Porro cesarean section in chronic nephritis is not only as a sterilizing method in women with permanently impaired kidneys but also as a preventative for postpartum uremia.

In considering Porro cesarean section as a method for sterilization one must demonstrate the absence of increased risk over the other sterilization methods. Our series had no mortality in those cases in which sterilization was the only indication. Williams preferred this

method of sterilization to avoid future conception. Also the usual clinic patient is unable to return for a later sterilizing operation because of her household duties.

The high morbidity of 69.8 per cent can be expected in the light of Harris' histologic studies of amputated uteri from Porro cesarean sections. He found that in women with labors of six to eighteen hours' duration, 80 per cent of the uteri showed inflammatory reactions, and when the uterus was removed late in the first or second stage, 64.3 per cent showed such changes. From this information we should have expected a morbidity of 73.5 per cent because of the intrapartum infections, the duration of the rupture of the membranes, and long labors as shown in Table IV.

The mortality rate is high (11.3 per cent) and may be explained by the serious condition of the patients treated, since the operation is employed only as a last resort for delivery. There were some patients whose lives were saved by the operation. A striking example is that of a colored multipara with preeclampsia who had two bag inductions (extending over twenty-seven hours) which failed. She developed an intrapartum infection, and it was evident she could only be delivered from above. During the operation gas escaped from the vagina and the uterus was removed without opening it. Cultures from the uterus revealed *Bacilli welchii* and hemolytic streptococci. She recovered although she had a febrile postoperative course and an infected abdominal wound.

It is difficult to compare mortality statistics of various clinics because of the difference in indications and variation in conditions and types of patients. Thus Eardley Holland's series of 46 Porro cesarean sections showed a mortality rate of 17.4 per cent; Lazard in a series of 51 such operations reports 4 deaths or 7.8 per cent. Harris found in the 64 Porro operations done at the Johns Hopkins Hospital up to 1922, a mortality incidence of 4.68 per cent. Phaneuf reported 25 consecutive cases without maternal mortality.

Abstracts of the histories of the six maternal deaths are as follows:

CASE 1.—E. T., a colored, thirty-year-old para vi, with preeclampsia, had a bag induction which failed to induce labor but was followed by an intrapartum infection. A hysterectomy followed a classical cesarean section. The patient died of an acute fibrinous peritonitis on the eighth postoperative day.

CASE 2.—M. K., a white, forty-three-year-old para viii, with a preeclampsia superimposed on a chronic nephritis, having a blood pressure of 264/140 and a premature separation of the placenta, died from shock on the operating table.

CASE 3.—T. C., a colored, twenty-six-year-old para iv, had a disproportion with a two-hour labor and membranes ruptured ten hours. She showed evidence of an intrapartum infection, and a Porro cesarean section was done. She died of a generalized peritonitis on the tenth day.

CASE 4.—J. K., a white, twenty-one-year-old para ii, had a previous cesarean section and came to the hospital in labor. The occiput being below the spines she

was allowed to labor for twenty-six hours when she ruptured her uterus. At operation the baby was found in the peritoneal cavity. A septic course followed and she died from a diffuse suppurative peritonitis on the eleventh postoperative day.

CASE 5.—R. W., a white, forty-one-year-old para ix, had a placenta previa centralis. A classical cesarean operation was followed by a hysterectomy. She died of a generalized peritonitis on the sixth postoperative day.

CASE 6.—D. McK., a colored, thirty-seven-year-old para iii, a preeclamptic with a blood pressure of 250/190 and a placenta previa, had a low cervical cesarean section followed by a hysterectomy. The patient died of cardiac failure on the ninth postoperative day.

The brief details of the fatal cases indicate that infection is still a serious complication in spite of the radical procedure. Phaneuf advises drainage through the cervix even if it not absolutely necessary. His advice is certainly based on justifiable results, as mentioned above. The only patient of the whole series who had a drain through the abdominal wall was the one with the *Bacillus welchii* infection described above. It is evident that even the radical operation is hazardous in the presence of infection. Two of the deaths in Lazard's series followed infection. These two were from a group of nine cases of infections. Therefore, it may be advised from the experiences of others and ours, that in the presence of frank infection, every precaution should be taken to protect the peritoneal cavity from infection by eventrating the unopened uterus and carrying out all work extraabdominally and draining through the cervix.

SUMMARY

1. The Porro cesarean operation is not often performed but when necessary plays an important rôle in surgical obstetrics. The indications are usually life saving in infected or acutely anemic women, as during or following hemorrhage and, therefore, the mortality is high (11.3 per cent).

2. The indications being chronic nephritis, tuberculosis, or sterilization, the mortality should be much lower than when infection is present or nil.

3. Proper precautions and cervical drainage may be aids in preventing fatal peritoneal infections following Porro cesarean section.

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CESAREAN SECTION*

AN ANALYSIS OF FIVE HUNDRED CONSECUTIVE OPERATIONS

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INCIDENCE?

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THE cases analyzed in this paper are the first 500 cesarean sections performed since the opening of the Chicago Lying-in Hospital in affiliation with the University of Chicago. There were 8,871 babies delivered in the hospital weighing 1,500 gm. or over, from May, 1931, to September, 1934. There were 8,622 white women delivered in their homes by home delivery services. Their pathologic cases were sent to this hospital. The hospital does not admit negro patients.

The incidence of cesarean sections for the entire series (17,493) was 2.86 per cent.

The incidence of cesarean sections among the hospital cases (8,871) was 5.6 per cent.

There were 39 operators for the entire series, no one of whom operated upon more than 9 per cent of the 500 patients. The courtesy staff of the hospital, which consists of physicians in private practice, operated upon 24.8 per cent of the patients. Members of the Departmental Staff of the University of Chicago operated upon 75.2 per cent of the cases.

TYPES OF OPERATIONS

279 Laparotrachelotomies	55.8 per cent
182 Laparotrachelotomies and sterilization	36.4 per cent
30 Porro cesarean sections	6.0 per cent
8 Classical cesarean sections (4 sterilized)	1.6 per cent
1 Vaginal cesarean section	0.2 per cent
216 of the patients were sterilized	43.2 per cent
112 Madlener technic	51.8 per cent
74 Resection of tubes (Adair technic)	34.5 per cent
30 Porro sections	13.9 per cent

MATERNAL MORTALITY

The total maternal mortality for the 500 cesarean sections was 1.0 per cent. Of the five cases which died, two were operations performed antemortem to obtain a living child from patients with tubercular meningitis. One was a decompensated cardiac case, in critical condition at time of operation. One death resulted from

*Presented at a meeting of the Chicago Gynecological Society, February 15, 1935.

postoperative intraabdominal hemorrhage from a bleeding omental vessel. The fifth death was the result of generalized infection in a patient with endocarditis of long duration.

MORBIDITY

The standard as advocated by the American Committee on Maternal Welfare was used in calculating the morbidity of these cases. Stander, in a recent article on morbidity and mortality, has used practically the same standard. Any patient with a temperature of 38° C. (100.4° F.) or over recorded on any two days after the first twenty-four hours postpartum, oral temperature readings being made at least four times daily, is regarded as febrile. All deaths are included in the morbidity figures whether there was a febrile morbidity or not.

Of the 500 cases 234 were febrile according to the above standard, or 46.8 per cent. (Average morbidity, British Standard, for all cases delivered in hospital, 15.4 per cent.) Twenty-three or 4.6 per cent of the patients remained in the hospital longer than fourteen days. Of the 279 patients having simple laparotrachelotomies 49.1 per cent became febrile. Of the 182 patients having laparotrachelotomies and sterilization 38.3 per cent became febrile. The lower morbidity in the sterilization group is explained by the fact that these operations were mostly elective. Of the 30 patients having Porro cesarean sections, 66.6 per cent became febrile. (Potentially infected cases.) Of the 8 patients having classical cesarean sections, 75.0 per cent became febrile. The one vaginal cesarean section was febrile.

Influence of Labor on Morbidity.—Of the 500 patients 162 or 32.4 per cent were in labor at time of operation; 59.9 per cent of the patients in labor at time of operation became febrile. Eighty-six patients were in labor twelve hours or more, 66.3 per cent of these became febrile. Seventy-six patients were in labor less than twelve hours, 52.6 per cent of these became febrile.

Influence of Ruptured Membranes on Morbidity.—Of the 500 patients 103 or 20.6 per cent had ruptured membranes at time of operation. Of the patients with ruptured membranes 62.2 per cent were febrile. Forty-two patients had ruptured membranes for over twelve hours; 69.0 per cent of these became febrile. Sixty-one patients had ruptured membranes for less than twelve hours; 58.3 per cent of these became febrile.

FETAL MORTALITY

There were 14 stillborn babies, eleven of whom were premature. Abruptio placentae accounted for 12 of these deaths, placenta previa for one, and eclampsia for one.

Seventeen babies, of which 14 were premature, died in the neonatal period. Abruptio placentae explained six of these deaths, placenta previa two, congenital heart two, eclampsia one, hydrocephalus one (lived two and one-half months), primary atelectasis two, and cause of death was undetermined in three. A total of 31, or 6.2 per cent of the babies were lost. Of these 25, or 5.2 per cent were premature. Abruptio placentae or placenta previa accounted for 4.2 per cent. (Average fetal mortality for all hospital deliveries of infants weighing 1,500 gm. or more, was 3.75 per cent.)

INDICATIONS FOR OPERATION

Many patients presented multiple indications for operation so that it was necessary to classify them according to the major factor in making the decision for operation in each case. Contracted pelvis, 200 cases, or 40.0 per cent; preeclampsia, 44 cases, or 8.8 per cent; placenta previa, 40 cases, or 8.0 per cent. Previous cesarean section (no other indication other than desire for sterilization or threatened

rupture of uterine scar of former operation), 39 cases, or 7.8 per cent; cardiac disease, 35 cases, or 7.0 per cent; abruptio placentae, 25 cases, or 5.0 per cent; dystocia dystrophy syndrome, 22 cases, or 4.4 per cent; chronic nephritis, 20 cases, or 4.0 per cent; cervical dystocia, 12 cases, or 2.4 per cent; cephalopelvic disproportion, 10 cases, or 2.0 per cent; eclampsia, 8 cases, or 1.6 per cent; previous repeated stillbirths, 8 cases, or 1.6 per cent; fibromyomas of uterus, 5 cases, or 1.0 per cent; elderly primipara, 4 cases, or 0.8 per cent; umbilical or ventral hernia, 4 cases, or 0.8 per cent; diabetes mellitus, 3 cases, or 0.8 per cent; prolonged labor with uterine inertia 2, previous Duehrssen's incisions and difficult delivery 2, Bandl's ring 2, pulmonary tuberculosis 2, tuberculous meningitis 2, tuberculous hip 1. Carcinoma of the cervix, hydronephrosis, transverse presentation, Gaucher's disease, brain tumor, purpura hemorrhagica, twisted ovarian cyst, and acute cholecystitis, one each.

PREVIOUS CESAREAN SECTIONS

Of the patients in this series 144 or 28.8 per cent had a previous cesarean section; 115 or 23.0 per cent had one previous cesarean section; 27 or 5.0 per cent had two previous cesarean sections; 2 or 0.4 per cent had three previous cesarean sections.

The majority of the previous cesarean sections had been performed in other hospitals, many were classical, and in a few there was definite defect in the uterine scar. We do not adhere to the dictum "once a cesarean always a cesarean." Of the 144 patients with a previous cesarean section 104 or 72.2 per cent were sterilized; 80 or 69.0 per cent of the 115 patients with one previous cesarean section were sterilized; 23 or 85.2 per cent of the 27 patients with two previous cesarean sections were sterilized; 2 or 100 per cent of the 2 patients with three previous cesarean sections were sterilized.

A patient is not sterilized with her first cesarean section unless she is suffering from an organic disease which future pregnancies would aggravate. If a second cesarean is indicated and the patient and her husband request sterilization, it is performed. We advise that the patient be sterilized at the time of a third cesarean section.

PREVIOUS STILLBIRTHS

Of the women who had previously borne children 22.4 per cent had had stillbirths; 43.2 per cent of the multiparas who had no previous cesarean section had had stillbirths; 45 had one previous stillbirth; 19 had two previous stillbirths; 2 had three previous stillbirths; 1 had four previous stillbirths.

The majority of the previous stillbirths resulted from prolonged labors, difficult instrumental deliveries and neglected cases. The indication for cesarean section in most of the cases was contracted pelvis, but in a few cases cesarean sections were done because of the history of previous difficult deliveries and resultant stillbirths.

PERIOD OF GESTATION

Ten per cent were from forty-one to forty-four weeks, 48.8 per cent were in the fortieth week, 34.4 per cent varied from thirty-six to thirty-nine weeks, and 6.8 per cent were from twenty-seven to thirty-five weeks.

The operations performed before the thirty-sixth week of gestation were almost entirely upon patients having abruptio placentae or severe toxemia as indications. Although the fetal mortality is high in the group under thirty-six weeks' gestation, it would have been higher with delivery from below using bags or other methods of mechanical induction, etc. We feel that the maternal risk in an abruptio placentae of any degree of severity is less when treated by cesarean section.

ANESTHESIA

Our anesthetic of choice for laparotracheotomy is novocaine, one-half per cent used for local infiltration. Medication with morphine and scopolamine may be used as the operation is started, because we believe there is little effect on the fetus if it is delivered within one hour. More sedative may be given if necessary after the baby is born. There were no fetal deaths in this series attributed to morphinism.

Ethylene is used to supplement local anesthesia when necessary. Some patients in labor are difficult to control under local anesthesia and ethylene is the initial anesthetic. Ether is added only when ethylene fails to relax the patient sufficiently.

Recently a few patients have been operated upon under avertin and local anesthesia when local alone was not thought suitable. Too few of these cases have been observed to draw any conclusions. Local anesthesia alone, 324 cases, 64.8 per cent; local and ethylene 65 cases, 13.0 per cent; local, ethylene, and ether 8 cases, 1.6 per cent; ethylene 65 cases, 13.0 per cent; ethylene and ether 32 cases, 6.4 per cent; ether 1 case, 0.2 per cent; avertin and local 5 cases, 1.0 per cent.

FATAL CASES

1. Mrs. L. G., aged twenty-four, grav. i, para i (No. 88306). Admitted Aug. 16, 1933 when thirty-three weeks pregnant. In coma for five days, critical condition. Spinal fluid pressure 6.00 mm. H₂O, yellowish, Ross Jones one-plus, 27 drops reduced 5 e.c. Benedicts, cell count 236 chiefly lymphocytes. Neurologic diagnosis: tuberculous meningitis.

Aug. 18, 1933: At request of family an antemortem classical cesarean section was done, delivering a 2560 gm. baby that is now living and well. Patient died four hours postoperative. No autopsy.

2. Mrs. E. A., aged twenty-two, grav. i, para i (No. 60403). Admitted July 18, 1932 when thirty-seven weeks pregnant. Sputum positive for tubercle bacilli. X-rays showed far-advanced bilateral pulmonary tuberculosis. Temperature for eight days preoperative averaged 101° F. and pulse 115. Condition critical with rapidly developing symptoms of meningeal involvement. Patient irrational.

July 26, 1932: Low cervical cesarean section under a local anesthetic. Baby weighed 2,795 gm. and survived. Patient became progressively worse. Inoculations of spinal fluid into guinea pig; tubercle bacilli recovered.

Died Aug. 6, 1932. Autopsy report: Generalized miliary tuberculosis with tuberculous meningitis.

3. Mrs. M. C., aged thirty-six, para vi, grav. vii (No. 48831). Admitted Jan. 30, 1932 when thirty-two weeks pregnant complaining of shortness of breath, chronic cough, edema of extremities, extreme weakness. Blood pressure 184/112. Pulse 100 to 110, blowing systolic murmur. R.B.C. 2,880,000. Hb 50 per cent. Diagnosis: Acute cardiac decompensation with mitral lesions, secondary anemia, chronic nephritis. Intravenous digitalis therapy for six days. Feb. 4, 1932: 500 e.c. blood transfusion. Feb. 5, 1932: Low classical cesarean section with tubal ligation under local anesthesia. Heart began fibrillating two hours later. Died of acute cardiac failure seventeen hours postoperative. Pathologist's report: chronic rheumatic mitral endocarditis with mitral stenosis and recent organizing subacute vegetative endocarditis. Generalized hypertrophy of the heart, chronic passive congestion of the lungs. Baby weighed 2,180 gm., died at age of two and one-half months of bronchial pneumonia.

4. Mrs. J. S., aged twenty-three, grav. ii, para ii (No. 44123). Admitted Jan. 13, 1932 when thirty-three weeks pregnant. Previous delivery three years ago else-

where by cesarean section after attempted forceps, vesicovaginal fistula followed. Generally contracted pelvis. Chills and fever with backache for two days before admission. Urine loaded with pus.

Diagnosis: Pyelitis complicating pregnancy. Temperature fluctuating between 102 and 104° F. for two weeks before infection subsided. Second two weeks of hospitalization temperature averaged 99°, probably due to chronic urinary infection resulting from fistula.

Feb. 13, 1932: Low cervical cesarean section under a local anesthetic. Uterus and omentum adherent to anterior abdominal wall, many adhesions ligated and incised. Patient went into shock twenty hours postoperative. Intravenous glucose and acacia solutions given while donors were coming in. Twenty-five hours postoperative diagnosis of intraabdominal hemorrhage was made, laparotomy done and omental bleeders tied. Patient died on operating table. Diagnosis: Exsanguination anemia from small omental vessels.

5. Mrs. I. G., aged twenty-five, grav. ii, para i (No. 97506). Admitted May 29, 1934 when thirty-nine weeks pregnant with dyspnea on exertion, palpitation and edema of extremities. Rheumatic heart disease had been diagnosed early in pregnancy. Medical diagnosis on admission: mitral stenosis and further pregnancies were felt to be contraindicated.

June 1, 1934: Low cervical cesarean section and tubal ligation under local, avertin and ethylene anesthesia. Patient had been in labor two hours. Prolonged septic postoperative course with peritonitis. Oxygen tent used night and day for several weeks. Numerous blood transfusions and other supportive therapy.

July 27, 1934: Attempt to drain perisplenic abscess failed. Allowed to go home Aug. 14, 1934 at request of family although condition was very poor. Temperature had been averaging 99° for four days previously. Died at home Aug. 18, 1934. Autopsy diagnosis: Mitral stenosis with recent vegetative endocarditis, multiple infarcts of lungs and spleen, pelvic thrombosis, endometritis, parametritis, subacute peritonitis with multiple adhesions and abscess formation.

Ludwig, Fritz: Operative Treatment of Congenital Umbilical Hernia, *Ztschr. f. Geburtsh. u. Gynäk.* 105: 308, 1933.

Congenital umbilical hernia occurs about once in 6,600 deliveries. The prognosis is always grave. Hernias vary in size from small protrusions to complete eversion. In German literature 125 cases are reported during the last fifty years; 86 of these were operated and cured. Most cases are not reported because the infants died either from operation or from conservative measures. The writer has operated upon three infants within a few hours after delivery. One baby died, two were cured, one of which required a second operation because of intestinal obstruction many years later. Operation very soon after a delivery, performed with utmost sterile technic, affords the most favorable chances; delay means infection.

GROVER LIESE.

A REVIEW OF TWENTY-SIX CASES OF EXTRAPERITONEAL (LATZKO) CESAREAN SECTION*

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FREQUENTLY enough, one encounters on a general obstetric service, patients long in labor, with a live baby, presenting part unengaged, or only fixed at the inlet, membranes ruptured, having had many vaginal and rectal examinations, perhaps with attempts at delivery vaginally, and either frankly or potentially infected, and in whom delivery from below with satisfactory results for both mother and child are not to be expected. Termination of such a labor vaginally can be accomplished only by undertaking procedures which, from the standpoint of the fetus, will yield either a severely traumatized infant or one with absolutely no chance of survival.

So far as the mother is concerned, if one could proceed in the presence of the above facts, and effect delivery by means of a cesarean section, and have no dread of subsequent sepsis, the solution would be easy. One would then have no further concern with the many disagreeable features and attendant technical difficulties of the alternative choice of a vaginal procedure; and the almost certain extensive traumatization of the maternal soft parts and the depressing shock associated with termination by the vaginal route would be circumvented. But in the type of case before indicated, can one proceed to use a transperitoneal approach to the uterus and feel reasonably sure that his efforts will not be thwarted by a subsequent fatal peritonitis?

Any study of the various statistical surveys shows clearly that, while the operation known as laparotrachelotomy or double flap, or a low cervical type of section is unquestionably far safer, and should, in the very great majority of all cases, supplant the old high classical type of operation, yet the same figures, just as unerringly, indicate that any transperitoneal operation in frankly infected or potentially infected cases which have been long in labor does not yield uniformly satisfactory results for the mother. Even with the far wider use of the lower segment type of operation, the problem of peritoneal infection following upon cesarean section still remains a formidable factor in all classes of cases, and infinitely more so in the so-called frankly infected or potentially infected group.

*Read before the Section of Obstetrics and Gynecology, New York Academy of Medicine, January 22, 1935.

One feels that if the field could be approached abdominally, and the peritoneal cavity spared invasion, this would offer our best method of procedure. It is generally conceded that the best results can be obtained, as far as protecting the peritoneum is concerned, by making use of a true extraperitoneal approach to the lower segment.

We present here a small series of 26 cases in which we have utilized the extraperitoneal type of operation following the technic ascribed to Latzko and popularized in New York by Jellinghaus. We are not offering this series with the idea of presenting any new facts concerning this operation, neither do we wish to go into any exhaustive theoretical presentation concerning its advantages. We are concerned with only the presentation of the observations and facts gleaned from our own experience with the operation. I will not discuss here in any further detail the indications for, nor the advantages of, the operation. Neither will I set forth the technic, for all this follows closely that described previously by Steele¹ and Burns.² The disadvantages cited by

RECORD OF CASES

TABLE I

NUMBER OF CASES	AGE	PARITY	HOURS IN LABOR WITH RUPTURED MEMBRANES			TOTAL HOURS IN LABOR	
			Shortest	15.0 (2)	Average	9.5	Average
26	Youngest 19.0	P. 20	Shortest	15.0 (2)	Average	9.5	Average
	Average 26.5		Average	36.5	Average	41.0	
	Oldest 38.0	M. 6	Longest	90.5	Longest	94.5	

Of the 26 cases, 6 occurred in multigravidae. Of these 6 cases, 2 had only abortions, and no labors at term. Of the remaining 4 cases, one was a para vi, gravida vii, with membranes ruptured thirty-eight hours and in active labor forty-three hours. She was admitted to the hospital after an attempt at delivery with forceps in her home under ether anesthesia. Blood pressure 190/110, preeclampsia. The fetal heart was heard immediately before operation. A stillborn fetus was delivered by Latzko section.

A second case, para ii, gravida iii, in active labor for forty-eight hours with ruptured membranes for an uncertain length of time. Her first labor, complicated by eclampsia and terminated by forceps, resulted in a stillbirth. Her second labor was induced by bag insertion, and resulted in another stillbirth. In her third labor, a normal living baby was obtained by section.

The third case was a para i, gravida ii. First labor 16 months previous, terminated by forceps. There were extensive perineal lacerations, with repair; was in bed for 6 weeks following her repair. This labor began with ruptured membranes; she was in labor for twenty-one hours, with membranes ruptured for the same period of time. Live baby.

Fourth case, para ii, gravida iv, had one abortion. Her first labor was terminated with forceps at term, stillbirth; second labor, forceps with neonatal death in twenty-four hours. This labor began with ruptured membranes, and after forty-one hours, section performed and live baby obtained.

Table I, showing the average length of time with ruptured membranes as 36.5 hours, and the average length of labor as 41 hours, indicates that the operation was not undertaken in this series until it became very evident that, with a long trial of labor, no progress could be hoped for.

Of the 26 cases, 16 had ruptured membranes longer than the average period of time (36.5 hours); 14 cases had an active labor longer than the average length of time (41.0 hours).

The case in labor 9.5 hours had ruptured membranes for over twenty hours.

TABLE II

NUMBER OF CASES	TYPE OF PELVIS	ENGAGEMENT		NUMBER OF VAGINAL EXAMINATIONS	NUMBER OF RECTAL EXAMINATIONS
		Yes	No		
26	Normal 1	Yes 0		0-3	1-22
	Abnormal 25	No 26			

There was but one normal pelvis in the entire group (case of placenta previa, previously bagged), who developed an intrapartum temperature of 103.8° F. In all cases there is noted either a definite "flat pelvis," or "generally contracted," or "generally contracted flat" pelvis or a "cephalopelvic disproportion." In no case was engagement of the presenting part present before operation.

TABLE III

Preoperative Morbidity and Complications:

- 8 cases had temperatures from 99° to 100.3°
- 5 cases had temperatures from 100.4° to 103.8°
- 1 attempt with forceps and ether outside of hospital
- 3 cases were bagged
- 1 placenta previa
- 2 cases had medical induction
- 1 adenoma of thyroid
- 4 preeclampsia toxemia

13 of the 26 cases had a preoperative or intrapartum rise of temperature. Five cases had temperatures from 100.4° to 103.8° F.

While the other preoperative complications are listed in this table, they in no way figured in the indication for the operation, except the one case of attempted forceps outside the hospital.

The case with placenta previa was a marginal type of implantation, bagged, which had a temperature rise to 103.8°; in labor twenty-nine hours with membranes ruptured twenty-eight hours.

TABLE IV

TOTAL NUMBER OF CASES	ANESTHESIA	NUMBER OF OPERATORS	PERITONEAL CAVITY OPENED		BLADDER INJURED	AVERAGE TIME FOR OPERATION
			Yes	No		
26	Spinal 23	4	Yes 9	No 17	Yes 2	55-60 min.
	Spinal and Ether 2				No 24	
	NO ₂ and Ether 1					

The spinal anesthesia used in the 23 cases was 100 mg. of novocaine crystals. In the two cases where ether was added to the spinal anesthetic, the time consumed from the administration of the anesthetic to the completion of the operation was too great to expect continued effectiveness from the spinal anesthesia.

The peritoneal cavity was inadvertently opened in 9 cases; these will be discussed in detail in the subsequent table.

The bladder was injured in 2 cases. In one case the opening was repaired at the time of operation by purse-string suture. The other case, on the second postoperative day, developed a urinary fistula through the abdominal incision, which healed spontaneously on the twelfth postoperative day.

The fifty-five to sixty minutes required for the performance of the operation are not considered unduly long when it is remembered that these are the first cases of this type coming out of our institution.

practically all commentators, and summarized by Burns, are: (1) Possibility of opening the peritoneum, and thus defeating the purpose of the operation. (2) Danger of injury to either the ureter or bladder. (3) Difficulty of performance and the length of time consumed.

TABLE V
PERITONEAL CAVITY OPENED 9 CASES

MEMBRANES RUPTURED HOURS	ACTIVE LABOR	HIGHEST POSTOPERATIVE		
		TEMPERATURE	PULSE	RESPIRATION
35.5	47.0	99.2	96	26
90.5	45.0	99.6	92	18
28.0	72.0 (approx.)	100.4	114	16
25.0	24.0	100.4	96	22
70.0	94.0	101.2	92	26
60.0	62.5	101.0	100	22
72.0	21.0	99.6	112	22
38.0	41.5	99.4	104	20
17.0	34.0	100.4	100	24

Table V shows in somewhat greater detail the postoperative course of the 9 cases where the peritoneal cavity was inadvertently opened. In all cases search was instituted for any rent in the peritoneum before the uterine incision was made. If one was discovered it was repaired before the uterus was incised. In some few cases, however, a hole was made into the peritoneal cavity during extraction of the head. This was repaired immediately. It is interesting to note in connection with these 9 cases, where the membranes had been ruptured for an average of about forty-eight hours, and active labor had gone on for about forty-nine hours, and the peritoneal cavity inadvertently entered, that the highest postoperative temperature was 101.4°.

TABLE VI
POSTOPERATIVE COMPLICATIONS

- 1 Cystitis and thrombophlebitis
- 1 Pyelitis
- 1 Vesical incontinence (cured)
- 1 Vesicoabdominal fistula (healed)
- 1 Pneumonia (spinal)

The only troublesome postoperative complications were (1) the vesical incontinence, which occurred in a case in which a retention catheter was needlessly employed for a long time, causing an edema of the bladder neck, and (2) the vesicoabdominal fistula which healed spontaneously.

The case of pneumonia was the placenta previa marginalis, bagged, with intrapartum temperature of 103.8°, which was later thought to be the first indication of the onset of the subsequent pulmonary complication. Spinal anesthesia was used in this case, but was not considered to be contributory.

TABLE VII
INFANT MORBIDITY AND MORTALITY

NUMBER OF CASES	DISCHARGED IN GOOD CONDITION	STILL-BIRTHS	NEONATAL DEATH	TOTAL OBSTETRICAL MORTALITY	CAUSES OF DEATH
26	22	3	1	4	(3) Intrauterine asphyxia

The three stillbirths were ascribed to intrauterine asphyxia and were considered to be due to the length of labor and the poor condition of the fetus at the time operation was undertaken. In all, the fetal heart was heard immediately before the operation was undertaken.

The neonatal death occurred on the second day postoperative from atelectasis.

I will attempt to demonstrate that, in this small series, we obtained what we consider better results from both maternal and fetal standpoints than we would have dared hope for with any other method of procedure, and that the objections above cited do not seem valid.

May I add here that the observations and conclusions included in this paper represent not alone the thoughts of the author but rather the consensus of all the operators from whose services the cases embodied in this report are taken.

TABLE VIII
MATERNAL MORBIDITY AND MORTALITY

NUMBER OF CASES	NO. OF CASES MORBID	AVERAGE NUMBER OF DAYS MORBID	DAYS IN HOSPITAL POSTOPERATIVE	DEATHS
26	18	4 days	Shortest 12 (2) Average 19 Longest 33	None
		15 longest		

Of the 26 cases operated upon, 15 had a marked postoperative course. The standard of morbidity used was a rise in temperature to 100.4° F. on any 2 readings following the first twenty-four hours on patients having their rectal temperatures recorded every four hours.

Four days was the average length of the morbid course in these 15 cases.

The longest postoperative stay was thirty-three days, in the case with the urinary incontinence.

There were no maternal deaths.

CONCLUSIONS

1. Obstetric problems may present themselves which can be adequately handled only by an abdominal type of delivery.

2. Infection of the peritoneal cavity, which is the chief deterrent in the utilization of the abdominal route, may be avoided, and a satisfactory maternal and fetal outcome anticipated, in a very high percentage of cases by a true extraperitoneal approach to the lower uterine segment.

3. The objections to this type of operation; namely, (a) invasion of the peritoneum, (b) bladder injury, (c) length of time consumed in the performance, should not be considered insurmountable difficulties for the obstetric surgeon.

4. Our experience with the inadvertent opening of the peritoneal cavity seems not to justify the statement that it defeats the purpose of the entire operation.

5. With the Latzko type of operation at his command, the obstetric surgeon may still perform the cesarean section with safety for both mother and child in many cases otherwise beyond his reach.

Grateful acknowledgment is hereby made to Drs. S. A. Cosgrove and P. O. Hall, and the late Dr. J. A. Binder, for permission to use the cases from their services.

REFERENCES

- (1) Steele, K. B.: AM. J. OBST. & GYNEC. 19: 747, 1930. (2) Barnes, H. T.: AM. J. OBST. & GYNEC. 19: 759, 1930.

THE THERAPEUTIC VALUE OF LOW-DOSAGE IRRADIATION OF THE PITUITARY GLAND AND OVARIES IN FUNCTIONAL MENSTRUAL DISORDERS*

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IN THIS purely clinical presentation of the subject, we studiously avoid discussion of the controversial problem of the mechanism whereby small doses of roentgen rays enhance functional activity of the ovaries or any other gland of internal secretion. We wish, however, to clarify our conception of the term "x-ray stimulation" very often employed synonymously with the term "low-dosage irradiation." They connote an increase in cell activity without evident microscopic changes in structure, produced by a dose only slightly greater than the one employed in extensive diagnostic procedures, nevertheless sufficient to excite changes in the equilibrium of the cell constituents. That the secreting elements of glands may hyperfunction or underfunction without evident alterations in cell structure is strikingly illustrated by the absence of histologic changes in the islands of Langerhans in some cases of hyperinsulinism and in nearly half of the diabetics who come to autopsy. It, therefore, is apparent that biochemical factors alone, such as cell permeability and arrangement of electrons, atoms, and molecules, often determine the degree of cell activity.

The phenomenon of cell stimulation should not be confused, however, with that of cell irritation. The latter, according to Lehmann,¹ is the summation of oft-repeated stimulation and eventually leads to destruction of the cell. "True stimulation," he states, "is present when after a small dose of rays or a small number of repetitions there occur phenomena of functional stimulation not followed by inverse effects in the irradiated gland." Restoration of ovarian function and of menstrual periodicity through low-dosage irradiation of the pelvis, therefore, is evidence of true stimulation in contradistinction to the improvement in genital function that occasionally follows destructive irradiation of pituitary or adrenocortical adenomas. X-ray effects short of cell injury are not demonstrable by the instruments at our disposal. They manifest themselves in the form of accelerated function.

SELECTION AND CLASSIFICATION OF THE CLINICAL MATERIAL

In this study we merely present the summation of our observations on the effects of a given dose of roentgen rays on the menstrual cycles of

*Read at a meeting of the Obstetrical Society of Philadelphia, March 7, 1935.

normal, amenorrheic and metrorrhagie women, followed up for periods averaging over two years. The patients were carefully examined to exclude factors not directly related to pituitary and primary ovarian deficiencies as the responsible agents for the menstrual disturbances. The possible presence of an early pregnancy was eliminated by physical examination and, when necessary, by means of the standard biologic tests. Cured or improved patients who received simultaneously, with or soon after x-ray treatment, some form of organotherapy are excluded from this study on the assumption that the latter may have contributed to the good results. Patients who failed to respond to combined roentgen ray and endocrine therapy are, on the other hand, included in our list of failures because of our conviction that the endocrine products were not responsible for the lack of response to the irradiation. We have also excluded from our statistical study those patients whose follow-up period is less than a year and, from our list of cures, those who failed to respond within two months after termination of treatment. Adherence to these rigid requirements, set up as a guard against erroneous deductions, justifies the presentation of this report because the literature on the subject lacks these elements of security against too hasty and unfounded conclusions.

Of the 102 patients comprising the study, 51 had pronounced amenorrhea; 21 had menstrual periods (with or without prolonged or excessive flows) at intervals of six to thirteen weeks; 13 were definitely metrorrhagie in type; 6 had excessive flows at normal intervals; 5 had short and scanty flows at normal intervals; and the remaining 6 were menstruating normally but were sterile for no accountable reason.

DOSAGE AND TECHNIC

The treatment of the patients was entrusted to three roentgenologists who, by agreement, employed a uniform dose and technic. The patients received three weekly exposures of the pituitary gland and ovaries. The technic employed is described by one of them (Edeiken²) as follows: "In the patient of average size, the technical factors are 127 K.V., 5 M.A., 14 inch distance, 5 M.M. aluminum filter for 3 to 5 minutes. This is equivalent to 7½ to 12½ per cent S.E.D. or 50-80 R. This dosage is varied according to the size of the abdomen and the thickness of the abdominal wall. . . . The central ray [in the pituitary exposure] enters just above and posterior to the midpoint of a line drawn between the outer canthus and the external auditory canal." In nearly half of our patients, the pituitary gland and the ovaries were treated simultaneously; in the others, the exposures were made alternatingly at three-to four-day intervals. The results are approximately the same in both groups of patients.

Five of the fifty-one amenorrheic patients with definite evidence of adiposogenital dystrophy received pituitary irradiation alone; three were cured; and two failed to respond. Four patients suffering from the amenorrhea of primary hypogonadism were treated by irradiation of the ovaries alone; two were cured and the condition of the other two remained unchanged. Unless it is certain that the menstrual disturbance is due to a primary hypogonadism, the pituitary body as well as the ovaries

should be treated. Irradiation of the pituitary gland alone, even in frank cases of adiposogenital dystrophy, will probably prove to be less effective in a larger group of patients.

SAFETY OF LOW-DOSAGE IRRADIATION OF THE OVARIES

No roentgenologist fears low-dosage irradiation of the pituitary gland, since experience with intensive treatment of pituitary adenomas has shown how resistant the normal elements of the gland are to x-rays. The profession, as a whole, and roentgenologists, in particular, are reluctant, however, to expose the ovaries even to mild irradiation because of the reports of Frank³ and others that the temporary amenorrhea of some patients had become permanent as a result of such treatment. In mentioning these untoward effects, the authors unfortunately fail to state the respective age of the patients and the doses employed—factors of great importance. It is possible, moreover, that these partly amenorrheic women would have lapsed into a state of permanent amenorrhea without the use of x-ray treatment. It is evident, therefore, that possible harmful effects can be determined more accurately through studies of the menstrual rhythm of regularly menstruating women subjected to ovarian irradiation of similar dosage.

For this purpose we have carefully recorded for a period of nearly three years after low-dosage irradiation of the ovaries and pituitary gland the menstrual cycles of eleven regularly menstruating women, six of whom were sterile without apparent cause and five of whom complained of hypomenorrhea. *In none of them was the menstrual rhythm affected by irradiation in doses within the limits indicated above.* This, in our opinion, is sufficient clinical proof of the safety of the procedure and discounts definitely the impression of harm when occasionally a partially amenorrheic woman incidentally passes into a more permanent state of amenorrhea following low-dosage irradiation of the ovaries. We have encountered this sequence of events in only two of sixty-nine partially amenorrheic women thus treated. We must, nevertheless, remember that the margin between the safe and harmful dose is probably limited. Variation in dosage should, for the present, not exceed that employed in the treatment of our patients. Further evidence of the harmlessness of the procedure is the fact that seven of eleven of our amenorrheic patients, who had received more than one course of x-ray exposures at intervals of three months, were restored to normal menstrual periodicity, and that in none of the remaining four was the condition thereby aggravated.

One of the six regularly menstruating but functionally sterile women subjected to irradiation bore two healthy children. Another one is near term of pregnancy. The hypomenorrhea of the five in the group of eleven was not improved by the treatment, confirming our impres-

sion that the cause of hypomenorrhea lies in the lack of responsiveness of the uterine mucosa and that the condition is independent of the pituitary-ovarian mechanism.

In the category of regularly menstruating women, unaffected adversely by x-ray treatment, we may include six patients who menstruated with clocklike regularity but had, for a long time (nearly five years), either excessive or prolonged flows. Examination of endometrial tissues excluded the presence of intrauterine pathology other than varying degrees of hyperplasia. The six patients were followed up for periods averaging nineteen months. In none of them was the menstrual rhythm disturbed as a result of the roentgen-ray treatment. Three of the six were cured, 2 were improved, and the condition of one remained unchanged.

From the study of the records of these seventeen regularly menstruating women, we may conclude that x-ray exposures in doses within the limits outlined above do not interfere with the rhythm of the menstrual cycle and that fertility in those who desire and can bear children (six of the group of seventeen) is, at least, not lowered by the procedure. We may also infer that the dysfunctional menorrhagia of cyclically menstruating women is, to a large degree, controllable by this measure.

EFFECT ON AMENORRHEA

Of the 51 women in this group, 3 had never menstruated (primary amenorrhea), 12 had no menstrual periods during the year preceding treatment, and 35 had menstruated at intervals of four or more months but less than twelve months. The average duration of the disturbance for the entire group was 5.7 years. Twenty of these patients had received prior to the use of roentgen rays some form of organotherapy without relief.

Only one of the three patients with primary amenorrhea responded and has been menstruating at intervals of four to five weeks for a period of a year. The intensive organotherapy she received months before the x-ray treatment may have contributed to the result by increasing the growth and vascularity of the uterus. Twenty-two of the forty-eight women with secondary amenorrhea have been menstruating regularly for periods of one or more years, averaging 2.3 years; four improved in the form of increased menstrual frequency; sixteen failed to respond; and the remaining six conceived too soon (one to three months) after the roentgen ray therapy to enable us to evaluate its effect on menstrual periodicity. Four of these six women have been menstruating regularly for periods averaging three years since the weaning of their infants. Pregnancy in these four patients undoubtedly contributed largely to the subsequent reestablishment of normal menstruation. Two of the six remained amenorrheic despite the stimulus of pregnancy.

Twenty-three (49 per cent) of forty-seven amenorrheic women have been menstruating regularly for periods of one to four years, an average

of slightly more than two years for the group, without the stimulus of intercurrent pregnancies. There is no other agent at the disposal of the profession capable of producing this result with so little trouble and expense to the patient. One of the sixteen patients who totally failed to respond to treatment was presumably made worse. The intervals between periods became even longer than before treatment. Nine of the fifty-one amenorrheic patients received one or two additional courses of roentgen ray treatment after the first course of three exposures failed to produce more than slight improvement. Five of these nine fully responded to the additional exposures and are included in the group of twenty-three cures.

EFFECT ON OLIGOMENORRHEA (MODERATE DELAY IN MENSTRUATION)

Twenty-one patients had menstrual intervals of six to thirteen weeks. This irregularity connotes a milder form of ovarian deficiency, whether primary or secondary, than frank amenorrhea and yields more readily to treatment. The average duration of the menstrual disturbance for the entire group was 7.2 years. Nine of the group had received organotherapy without relief prior to the roentgen ray treatment. Eight of the twenty-one patients in this group have been menstruating regularly for periods averaging nineteen months since the treatment was given; six showed either slight or no improvement; one was presumably adversely affected by the treatment and menstruated thereafter at longer intervals; six who were previously sterile conceived so soon after the x-ray exposures (one to three months) that the immediate effect on menstrual periodicity cannot be gauged. They have been menstruating regularly, however, for an average period of two years since the weaning of their infants. Excluding these six from our calculation on the assumption that incidental pregnancies contributed to the eventual establishment of normal menstrual periodicity, the percentage of cures in the group of fifteen patients was a little over 50 per cent. Two of the patients required additional courses of treatment, given in three months, before a cure was accomplished.

EFFECT ON DYSFUNCTIONAL UTERINE BLEEDING (METRORHAGIA)

Thirteen women of childbearing age suffering from metrorrhagia of average duration of twenty months were subjected to low-dosage irradiation of the pituitary gland and ovaries. All of them had previously received organotherapy without relief. Ten of these thirteen patients fully responded and have remained well for periods averaging 2.8 years. One improved and two were not benefited by the treatment.

The greater response (80 per cent) of dysfunctional metrorrhagia of the childbearing age than that of amenorrhea confirms our conviction that metrorrhagia is a symptom of a milder form of the same endocrine

defect. In dysfunctional metrorrhagia the lutein phase alone is defective or totally absent, whereas in amenorrhea the ovarian follicle, the predecessor of the corpus luteum, is likewise functionally deficient and fails to produce enough estrin to rebuild the dismantled endometrium of the previous cycle. With this concept of the mechanism of the two seemingly opposing symptoms (an excess and an absence of uterine bleeding), we can readily understand why the same agent is helpful in both and more effective in the former. The only exception to this formula is the occasional case of hyperhormonal amenorrhea, a condition wherein the uterus is incapable of responding to a normal or even excessive supply of the follicular hormone.

EFFECT ON ASSOCIATED STERILITY

Sterility was either a primary or an associated factor in the majority of the 103 patients treated. Thirty-eight were married to fertile mates and had no discernible cause to account for the sterility other than disturbances of the menstrual rhythm. Eighteen of the thirty-eight conceived and gave birth to healthy infants; two are pregnant at this time; one aborted before an ultimate successful pregnancy; and another one aborted and subsequently no longer desired pregnancy. We may infer from these figures that correction of the menstrual defects was conducive to pregnancy in half of the functionally sterile woman. A few of the women not desiring pregnancy conceived involuntarily. There was a total of twenty-six live births and three abortions in the irradiated patients. The percentage of abortions is not larger than in those treated by other measures, though considerably larger than that current in normal women. The tendency of women suffering from menstrual disturbances and genital hypoplasia to abort is well known.

EFFECT ON PRIMARY DYSMENORRHEA

Fourteen of the 102 patients subjected to low-dosage irradiation had, as an associated symptom, varying degrees of primary dysmenorrhea. This is a rather low incidence in a group of patients, the majority of whom presented definite evidence of genital hypoplasia. We must remember, however, that the majority of these patients presented the stigmas of pituitary deficiency wherein dysmenorrhea, despite the associated genital hypoplasia, is rarely, if ever, a prominent symptom. Dysmenorrhea usually occurs in the primary hypogonadal type of women in whom the associated instability of the autonomic nervous system is apparently the major factor in the causation of menstrual pain. Five of the fourteen patients were relieved of dysmenorrhea when normal menstruation was reestablished; two were relieved by pregnancy that followed soon after irradiation; the dysmenorrhea of the remaining seven was not affected despite the fact that fully six of them were relieved of the associated menstrual irregularity.

SUMMARY

Twenty-three of forty-seven women suffering from severe amenorrhea have been menstruating regularly without the stimulus of incidental pregnancies for periods averaging 2.3 years following low-dosage irradiation of the ovaries and pituitary gland.

Eight of fifteen women suffering from a milder form of amenorrhea (oligomenorrhea) likewise were restored to normalcy without the aid of incidental pregnancies.

Ten additional patients of the twelve who conceived soon after x-ray treatment have been menstruating regularly for periods averaging 2.5 years.

Ten of thirteen patients of childbearing age suffering from dysfunctional metrorrhagia of long duration were cured by one course of treatment.

Associated sterility was relieved in twenty of the thirty-eight women who had no ascertainable cause to account for the condition other than menstrual disturbances.

Primary dysmenorrhea was an associated symptom in fourteen of 102 patients treated. Five of the fourteen were completely and permanently relieved without the aid of incidental pregnancies.

The menstrual rhythm of seventeen regularly menstruating women was not disturbed by the x-ray treatment. Seven of eleven amenorrheic women responded after a second or third course of treatment given at intervals of three months; the condition of the remaining four was not aggravated by repeated exposures. It is assumed, therefore, that the x-ray treatment was not responsible for the aggravation of the amenorrhea of the two patients who had received only single courses of treatment. Twenty-six healthy children were born to women who had received the treatment. These data indicate that the procedure is harmless.

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1829 PINE STREET

Nicholson and Calatroni: Primary Carcinoma of the Hymen, Bol. Soc. de obst. y ginec. 13: 692, 1934.

The authors state that they could find only two cases of primary cancer of the hymen reported in the literature. Their patient was a forty-eight-year-old woman. Pathologic diagnosis: Epithelioma.

MARIO A. CASTALLO.

BLOOD LOSS DURING CESAREAN SECTION

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A KNOWLEDGE of the amount of blood lost during delivery is very often of great importance, as the immediate and future management of the case frequently depends on the volume of the hemorrhage. Reports of the average blood loss vary markedly, which might be explained in part by the methods used in the determinations.

Various comments on the amount of hemorrhage, especially the clotted mixture of blood and amniotic fluid in the suction bottle, during cesarean section focused our attention on this problem. The solution to this problem involved an exact determination of the grams of hemoglobin lost at operation and the conversion of this figure into cubic centimeters of the patient's blood.

Schmid gives an extensive summary of the work that has been done in determining the blood loss at delivery. The figures in most of these reports are based on the measurement of the blood caught in a basin. Another method involves the weighing of all blood-stained linen, washing out of the blood and weighing a second time, the difference between the two representing the blood loss. A third method is the determination of the patient's hemoglobin before and after delivery, assuming that the difference represents the blood loss at delivery.

Williams, in 1919, concluded that the usual blood loss during spontaneous delivery ranged from 100 to 300 c.c. His method was to catch the blood in a basin and measure it.

Calkins reported that in 96 per cent of his patients the blood loss at delivery was less than 600 c.c. The average amount was 179 c.c. in 800 cases. He also measured the blood caught in a basin.

The method of catching the blood at the time of delivery frequently does not give the true value for the blood lost from the patient's circulation. Dieckmann and Wegner have noted that during labor there are varying degrees of blood concentration, which may be intensified by anesthesia. Therefore, the blood lost at delivery, if expressed in terms of hemoglobin concentration taken before the onset of labor, may be more than the volume indicates. This phenomenon may explain certain cases of shock, postpartum anemia or puerperal infection. A postpartum hemodilution with blood loss within normal limits indicates the fallacy of estimating the hemorrhage by determining the differences in hemoglobin concentration.

METHOD

Venous blood was obtained from the patient before delivery or, if possible, before the onset of labor. The hemoglobin was determined as acid hematin. A 1 per cent standard was made from a solution which contained 13.8 gm. of hemoglobin per 100 c.c. as determined by the oxygen capacity method. Ten grams of sodium citrate were placed in the suction bottle to prevent coagulation. All sponges were put in a basin which contained 1,000 c.c. of 0.1 N hydrochloric acid (10 c.c. of concentrated acid in 1,000 c.c. of water) and allowed to soak. The sponges were rinsed thoroughly in the above solution and wrung out dry by hand at the end of the operation. The solution from the sponges and from the suction bottle were mixed together and made up to the nearest convenient mark for dilution (viz., 2,500, 4,500, 6,000). Ten cubic centimeters of this solution were diluted further in a volumetric flask until it could be matched with the standard.

The following case may be cited as an example:

Patient C., No. 91075. Hemoglobin 12.56 gm. per 100 c.c. of blood. The solution amounting to 5,150 c.c. was diluted to 5,500 c.c.; 10 c.c. of this were diluted to 200 c.c., or 20 times. The standard was set at 20, and the unknown reading was 26.

$$\frac{20}{26} \times 0.00138 \text{ gm.} = 0.001061 \text{ gm. per c.c.}$$

$$5,500 \times 20 \times 0.001061 \text{ gm.} = 116.8 \text{ gm. hemoglobin blood loss.}$$

$$\frac{116.8}{12.56} \times 100 = 930 \text{ c.c. total blood loss.}$$

The ordinary laparotomy pad, consisting of six layers of gauze and measuring 8×16 inches, will hold 150 c.c. of blood; one measuring 16×16 inches will hold 300 c.c. of blood.

We were able to recover 87 to 90 per cent of the hemoglobin from a known quantity of blood. If the sponges were rinsed once and the rinsings added to the solution, we were able to recover 98 per cent. Our results, therefore, are at least 10 per cent too low. The use of a wringer and the determination of the hemoglobin from the iron content would simplify the method.

Gatch and Little used a somewhat similar method in determining blood loss from various types of operations. They reported the blood loss in terms of the patient's blood, but did not determine the hemoglobin loss or the patient's hemoglobin. There were four hysterectomies in their series, with a blood loss ranging from 210 to 310 c.c.

Our figures for the blood loss in cesarean sections, forceps and episiotomies, and spontaneous deliveries are given in Table I. The number of operative and spontaneous deliveries is very small. The amount of the blood loss is so variable due to the many factors accompanying delivery, that a study of a large series of cases would be of no particular value. It is obvious, as would be expected, that the minimum blood loss occurs with spontaneous delivery. The cesarean section series is large enough to warrant some generalizations. The wide range and occasional excessive blood loss are noteworthy.

The average blood loss for all the cesarean sections was 546.7 c.c., and the range was 170 to 1,410 c.c. Four cesarean sections were performed for placenta previa, with an average blood loss of 597.5 c.c. and a range

of 235 to 980 c.c. The blood loss in these cases was due to the bleeding from severed sinuses in the lower uterine segment. A low classical cesarean section would obviate this complication. Three cesarean sections

TABLE I

AMOUNT OF BLOOD LOSS C.C.	METHOD OF DELIVERY		
	CESAREAN SECTION	FORCEPS AND EPISIOTOMY	SPON- TANEOUS
Less than 100		1	4
100- 199	3	4	3
200- 299	2	4	1
300- 399	4	1	
400- 499	4	1	
500- 599	1	2	
600- 699	0	1	
700- 799	1	0	
800- 899	0	1	
900- 999	2		
1,000-1,099	1		
1,100-1,199	1		
1,410	1		
Number of patients	20	15	8
Average per case	538.9	342.3	106.8

were performed for abruptio placentae, with an average blood loss of 763.3 c.c. and a range of 440 to 1,410 c.c. including the hemoglobin content of the clots. The amount of blood which may be lost in a cesarean section performed by an experienced surgeon is astounding. None of the staff realized that the blood loss was more than 700 c.c. in seven out of twenty operations.

TABLE II

NUMBER	INDICATIONS FOR LAPAROTRACHELOTOMY	DATE	BLOOD LOSS HEMOGLOBIN AND VOLUME	HEMO- GLOBIN GM./100	HEMATO- CRIT %
83110	Placenta previa	11/29/33	115 gm.	11.7	43
		12/ 2/33	980 c.c.	8.4	28
		12/ 7/33		8.8	31
83191	Abruptio placentae 800 c.c. blood transfusion	11/18/33	154.4 gm.	10.9	31
		11/21/33	1,410 c.c.	9.9	29
		11/27/33		10.0	32
		3/ 7/34			47
83120	Contracted pelvis	10/30/33	116.8 gm.	12.6	
		11/ 1/33	930 c.c.	9.5	26
		11/ 8/33		9.0	27
		11/21/33		9.9	31
		2/27/34		12.1	42

The duration of labor previous to the cesarean section seems to be a factor in the amount of blood loss. Fifteen of the operations were performed before the onset of labor or within the first ten hours, with an average blood loss of 624 c.c. In five operations in which the duration of labor was over ten hours, there was an average blood loss of 256 c.c. It is obvious that there should be less blood loss after several hours of

labor because the lower uterine segment is more attenuated, the vessels are compressed, and the uterus is more irritable, thus contracting more rapidly after delivery.

The baby becomes a factor only when it weighs less than 2,000 gm., with a blood loss of 440 c.c., or over 4,000 gm., with a blood loss of 592 c.c.

Data for several illustrative cases are given in Table II. Hemoglobin and hematocrit determinations made 72 hours or more after delivery give a more reliable index of the blood loss than those made immediately after delivery. Erythrocyte counts at any time are of much less value than a proper hemoglobin and hematocrit determination.

COMMENTS

The following conditions and factors predispose to an excessive blood loss during delivery:

1. A marked anemia due to the lack of sufficient erythrocytes for a proper clot.
2. Prolonged labor because of partial atony of the uterus.
3. Multiparity—usually after the fourth pregnancy, because of faulty contraction of the uterus probably due to fibrosis or other changes in the uterine wall.
4. Overdistention of the uterus from multiple pregnancy, abnormally large baby, or polyhydramnios because of partial atony of the uterus or of the surface area of the placenta. Adair and Thelander have demonstrated a positive correlation between the area of the placenta and the weight of the baby.
5. Episiotomy or laceration of the cervix, vagina or perineum.
6. Improper management of the third stage of labor.

The blood loss may be kept at a minimum by (1) allowing sufficient time for the separation of the placenta, which usually occurs within one to six minutes after delivery; (2) by the expression of the placenta from the lower uterine segment or vagina, using the *contracted* uterus as a piston, and (3) by injecting pituitrin intramuscularly after the expulsion of the placenta.

The following additional conditions predispose to an increased blood loss during cesarean section:

1. Placental site underlying the uterine incision.
2. Rapid delivery of the infant, preventing proper contraction of the uterus.
3. Tears resulting from an inadequate uterine incision.
4. Elective operation and those performed early in labor.

Pituitrin should be injected into the uterine muscle after the head of the infant is delivered, and then after two or more minutes the remainder

of the baby should be slowly extracted. Thus the uterine muscle will have time to accommodate itself to the tremendous decrease in the size of the cavity, and the amount of the hemorrhage will thereby be lessened.

The amount of the blood loss must be correlated with the patient's weight and with her hemoglobin concentration. It is obvious that a blood loss of 1,000 c.c. from a patient weighing 50 kilograms and having a blood volume of 4,000 c.c. is of more serious import than the same amount from a woman weighing 70 kilograms, with a blood volume of 5,600 c.c. Furthermore, if the patient has an anemia or already has lost blood, an additional hemorrhage, even though not excessive, may be just enough to use up the last reserve of hemoglobin and death may result. Dieckmann and Wegner have demonstrated that although the average increase of the blood volume at term is 23 per cent, it is not sufficient to enable the pregnant woman to withstand a large blood loss, as is stated in many textbooks.

At the beginning of our study estimates of the blood loss by various observers were generally 100 to 700 c.c. below the actual amount. Later the difference between the estimated and determined amounts became much less. Thus, this study was of considerable importance in teaching our staff to estimate blood loss accurately, and also made them "hemorrhage conscious."

SUMMARY

1. A method for accurately determining the blood loss during delivery or operation is described.
2. The average blood loss in a spontaneous delivery was 107 c.c., in the delivery by forceps and episiotomy 342 c.c., and in the cesarean section it was 539 c.c.
3. Certain factors and conditions governing the blood loss are discussed.
4. Methods are described for the management of the third stage of labor, for delivery through the natural passage, and also by cesarean section.

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THE TREATMENT OF ABRUPTIO PLACENTAE*

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DURING recent years a very laudable interest has been shown in efforts to reduce maternal mortality rates. Unfortunately, a reduction in mortality from all causes cannot be hoped for. However, certain conditions offer ripe fields for improvement. Abruptio placentae, with its accompanying 40 to 60 per cent maternal mortality, is an outstanding example. This fact, together with our experience in connection with three recent cases of abruptio placentae, all ending fatally for both mother and child, has stimulated this presentation.

The etiology of abruptio placentae is based purely on theory. All writers stress traumatism, endometritis, diseases of the ovum, emotional states, and toxemia. It is quite possible that we must look to the early development of the placenta for the real underlying cause. This embryologic factor may quite possibly be a paucity of anchoring villi, so that the placenta is from the very beginning only loosely attached to the decidua basalis. Such a placenta, particularly when subjected to the additional pathologic changes that so frequently accompany late gestational toxemia, would naturally be expected to separate from its uterine attachment. It is generally believed to be more than a coincidence that a high percentage of infarction is found in the placenta in cases of gestational toxemia. Unquestionably, a placenta that is the site of large infarcts is less firmly attached to the decidua than is a normal noninfarcted placenta. Furthermore, it has recently been suggested that in the formation of placental infarcts certain toxic substances derived from the splitting of the proteins of the placenta are passed into the maternal blood stream. Although it has not as yet been proved, it is quite possible that among these toxic substances may be histamine, which Hofbauer has shown will reproduce the exact pathologic and clinical picture of abruptio placentae in pregnant animals which possess placentas whose structure is similar to that of man. Whatever may be the exact relationship between the two conditions, it is unquestionably true that the majority of severe cases of abruptio placentae occur in association with late gestational toxemia. We stress this point because of its importance in connection with the treatment of abruptio placentae.

The signs and symptoms of abruptio placentae are so well known that they need not be repeated here. Rather we will take time to discuss

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certain factors in connection with the pathology of this condition, and the effects of these pathologic changes upon certain of the physiologic functions of the uterus. The first step in the separation of the placenta is hemorrhage into the decidual portion of the placenta. This hemorrhage, small at first, rapidly increases in amount and so forms a retroplacental hematoma which further dissects the placenta from the uterine wall and so constantly opens additional blood vessels and blood spaces, thus increasing the retroplacental hematoma and causing pressure and irritation of the uterine muscle. This pressure of course is exerted equally in all directions but its greatest effect will be manifested in the direction which offers least resistance to its passing. This may be into the uterine muscle itself, into the depths of the placenta and so toward the amniotic sac, into which it may rupture (rarely), or between the uterine wall and fetal membranes and so finally reach the internal os, from which point the blood may escape into the vagina. As a result of the irritation of the uterine muscle, the uterus is usually thrown into a state of tetanic contraction which is maintained until fatigue of the muscle fibers results in a secondary relaxation. During the stage of tetanic contraction the blood vessels and venous sinuses at the site of the placental separation are compressed and further blood loss considerably retarded or even stopped. With the onset of fatigue and the relaxation of the uterus these vessels and venous sinuses again open up and more blood escapes. Regardless of the direction in which the main quantity of blood may be forced, there is always a considerable amount of blood forced into the uterine wall between the muscle fibers and in some cases enough is squeezed through the wall of the uterus to appear as petechiae or even hematomas under the serous coat. Rarely enough may be forced through the uterine wall to rupture into the abdominal cavity. Such extravasations of blood into the myometrium were called placental apoplexy by Couvelair. Let us consider the effect of these extravasations upon the physiologic functions of the uterus. As already stated, the irritation of this blood throws the uterus into a state of tetanic contraction. Such contractions greatly diminish the expelling properties of the uterine muscle so that the progress of labor in such cases is markedly retarded. That this tetanic contraction is distinct from the ordinary uterine contractions of labor is proved by the superimposition of rhythmical labor pains in a uterus which is constantly and continuously in this state of tetanic contraction. As the blood is squeezed into the myometrium it distends the wall of the uterus and separates the muscle fibers, and so greatly interferes with the function of reactivity. It is this function which enables the uterine wall to close down and reduce the uterine cavity as the contents of the uterus are passed out, into and through the birth canal. This function is, therefore, of great importance in the control of bleeding postpartum. Consequently, with the function of reactivity greatly diminished or even com-

pletely lost in abruptio placentae, postpartum hemorrhage is the natural sequel. In the normal uterus the functions of contractility and retraetility are so closely coordinated as to be practically indistinguishable. They are, however, separate and distinct functions, as was well illustrated in one of the cases reported in this paper, where the uterus remained in a fair state of contraction following the delivery of the child, but remained larger in size than is normal, thus indicating the loss of retraetility.

In the final analysis there is but one object to be considered in the treatment of abruptio placentae, namely, the prevention of further blood loss and the restoration of maternal blood volume. To best attain this object, however, a great number of related factors must be taken into consideration; thus the parity of the mother, the stage of pregnancy, condition of the fetus, condition of the cervix, and the clinical evidence as to the amount of blood already lost, are all of great importance. However, the factor that we desire to stress in this paper is time. The hemorrhage of abruptio placentae is so difficult to control because of the inaccessibility of the source of the bleeding. Furthermore, in those cases in which all or a large part of the placenta becomes detached, the amount of blood lost may be great within a very short time. In such a case with rapidly developing signs of profuse hemorrhage, prompt and energetic treatment is called for. Suitable blood donors must be obtained as quickly as possible and immediate cesarean section performed so as to prevent further blood loss. If necessary, a transfusion may be given before laparotomy is performed, but where the patient's condition warrants it, better results are obtained by withholding the transfusion until the hemorrhage has been controlled. Such cases do not give us a great deal of concern as to the form of treatment to be used. Our judgment is most taxed by those cases that are undoubtedly abruptio placentae but in which the patients show but little clinical evidence of blood loss. In these patients the question comes up whether to employ conservative measures in the hopes of being able to deliver the patient by the vaginal route or to use the more drastic cesarean section. It is this type of case in which the time factor becomes of great importance. In a multipara, with well-dilated birth canal and no disproportion, where labor is already in progress and advancing rapidly, one may well delay active interference for a reasonable length of time. In such cases the blood pressure, cardiac and respiratory rates, must be watched very closely, together with the other clinical signs of internal hemorrhage. As soon as the cervix becomes sufficiently effaced to be readily dilatable, manual dilatation with prompt delivery by version or forceps should be undertaken. Immediately after the delivery of the fetus, the placenta should be expressed and the uterus and vagina firmly tamponed with dry gauze. Pituitrin and gynergen, together with hemostatic serum, should be administered to assist in the contraction and

retraction of the uterus and to increase the coagulability of the blood. Blood transfusion may also be required in such cases. In a primipara with undilated birth canal and in all cases with disproportion or those in which labor is not progressing rapidly, immediate cesarean section will give the best ultimate result. It is not safe to permit any woman in whom a diagnosis of abruptio placentae has been made to remain undelivered for any considerable length of time, even in the absence of clinical evidence of profuse hemorrhage. In such cases, even though the patient may show little or no evidence of continuing blood loss, there is no reliable way of telling how much blood has been squeezed into the myometrium, and consequently no way of predicting how this myometrium will be able to function when the uterus is finally emptied. In these cases, cesarean section is by far the best method of treatment, since it permits us directly to inspect the uterus and to determine accurately the extent of myometrial damage. If sufficient extravasation of blood has occurred in the myometrium, as would in the opinion of the operator tend to prevent the matting together of the muscle fibers and the overlapping of muscle bundles, and to prevent proper retraction of the uterus after it is emptied of its contents, then coincident hysterectomy is indicated. In those cases where hysterectomy is not done the uterus should be firmly tamponed with gauze before suturing. Blood transfusion, injection of pituitrin directly into the uterine muscle, application of external heat, elevation of the foot of the bed, administration of cardiae stimulants, and all other supportive measures are used as indicated. It is our feeling, therefore, that delivery by the vaginal route in cases of abruptio placentae is warranted only when delivery is actually, immediately impending or may be promptly accomplished by the use of an obstetrie maneuver. In all other cases cesarean section is indicated and should be looked upon as the only logical method of treatment, rather than be considered radical obstetrics.

CASE REPORTS

CASE 1.—Mrs. B. L., aged forty-two, para vii. Last menstrual period began January 10. Her pregnancy proceeded normally until the morning of October 7, at which time she was about thirty-eight weeks pregnant. About 9:00 A.M. she began to have labor pains, and soon after their onset she suffered a severe lancinating pain in the lower abdomen and began to bleed from the vagina. This bleeding continued and her physician was called about 11:00 A.M. Upon his arrival he found that the patient had lost considerable blood externally and showed evidence of additional internal hemorrhage. No fetal heart sounds could be heard and fetal movements were not felt. Immediate hospitalization was advised but the patient refused. Her bleeding continued and finally the doctor packed her vaginally. This, however, failed to control her bleeding. Her condition became rapidly worse, until about 5:00 P.M. when the doctor insisted upon her going to a hospital. The patient was admitted to the Maternity Department of St. Agnes Hospital about 7:00 P.M., unconscious, in profound shock, and practically pulseless. Her temperature was subnormal, her skin cold and clammy. The uterus was greatly distended, globular, and

the fetal parts difficult to palpate. No fetal heart tones or fetal movements could be elicited. Vaginal examination eliminated the presence of placenta previa and confirmed the diagnosis of abruptio placentae. The patient was immediately treated for shock by the application of external heat, elevation of the foot of the bed, firm bandaging of the extremities, and the use of cardiac stimulants. An intravenous injection of glucose and saline was administered and blood taken for typing and cross agglutination. A transfusion of 500 c.c. of citrated whole blood was given immediately and preparations were made for cesarean section. The patient reacted only slightly. She became semiconscious and the pulse could again be palpated with difficulty at the wrist. Realizing that the case was a desperate one, we resorted to the only source that offered any hope of saving her life. Ether and oxygen were administered but she stopped breathing and additional restorative measures, including adrenalin given directly into the heart muscle, had to be resorted to. Respiration was again established and a second attempt made to administer an anesthetic, with exactly the same results as before. With great difficulty respiration was again re-established, but the patient's condition was so bad that she died before even a local anesthetic could be used.

Comment.—The time limit for any effective form of treatment had been reached long before this patient was admitted to the hospital.

CASE 2.—R. L., aged twenty-eight years. Patient had late gestational toxemia three and one-half years ago. Labor was induced at the seventh month and patient was delivered of a stillborn fetus. Subsequently, complete studies were made on the basis of which it was decided that she might safely become pregnant again.

Her last menstrual period began April 30, 1934. She progressed normally until early in November when her blood pressure rose to 140/90 and her pulse rate increased to 120. Urine showed a heavy trace of albumin.

At 8:00 A.M., on December 4, the patient was seized with severe, constant pain, in the lower abdomen. She had no vaginal bleeding. She was sent to the hospital immediately. Upon her arrival she was having intermittent pains but the uterus was boardlike and did not relax between pains. A diagnosis of abruptio placentae was made and a consultation held. Blood studies showed no evidence of severe internal hemorrhage. Her blood pressure remained at 140/90 and her pulse rate at 140. She showed no evidence, whatsoever, of shock. Because of these facts and because she was definitely in labor, it was decided to wait for spontaneous delivery rather than to operate. However, complete preparations were made for cesarean section, should the patient's condition require it. A suitable donor was kept in the hospital in the event blood transfusion might be necessary.

About 8:00 P.M., on December 4, the patient delivered herself of a stillborn fetus which was immediately followed by the expulsion of the placenta and several fairly large blood clots. She was given an ampule of pituitrin and one of gynergen and showed no abnormal bleeding. However, the uterus did not retract but remained practically the same size as it had been before delivery. The uterine cavity and vagina were, therefore, tightly packed. The patient seemed to be in fair condition. Within a few minutes, however, blood started to ooze through the packing. A blood transfusion was started immediately and the packing was removed and the uterus and vagina repacked. These measures, together with intravenous injection of calcium gluconate and intramuscular injection of parathormone, failed to stop the bleeding. The patient lost ground very rapidly and died on the table.

It is noteworthy that at no time following the delivery, in spite of repeated doses of gynergen with massage of the uterus, intrauterine irrigation of hot saline and repeated packings, did the uterus contract; it remained essentially the same size as before delivery.

The outcome of this case rather indicates that our judgment was faulty in not resorting to cesarean section immediately upon the patient's admission to the hospital.

CASE 3.—Mrs. A. R., aged twenty-one. Pregnancy normal throughout, until she went into labor at term. Had normal labor pains from 4:00 P.M. until 11:00 P.M. Then had a very severe pain in lower abdomen and noticed violent fetal movements, followed by complete cessation of fetal movements. Her pains continued throughout the night, but no progress was noticed in her labor. Her physician finally decided to send her to a hospital. She was admitted to the Maternity Department of St. Agnes Hospital at 10:00 A.M., Dec. 12, 1933. Examination immediately after admission revealed a tetanically contracted uterus, through which the fetal parts could not be palpated. The presenting part was not engaged. The cervix was thick and undilated. There was no vaginal bleeding but the patient showed clinical signs of internal hemorrhage. The uterine contractions were occurring at intervals of three minutes. A diagnosis of abruptio placentae was made and prompt treatment instituted. Blood transfusion was done and cesarean section started at 1:00 P.M. About two-thirds of the placenta was found to be detached and the uterus was filled with old blood clots. Because of the condition of the myometrium, supravaginal hysterectomy was performed. The patient was in bad condition throughout the operation and died just after she was removed from the operating table.

Comment.—Too much time was allowed to elapse between the separation of the placenta and the emptying of the uterus. This woman, a primipara, should have had a cesarean section twelve hours earlier.

SUMMARY

The treatment of abruptio placentae offers a ripe field for improvement in its maternal mortality rate.

The possible relationship between late gestational toxemia and abruptio placentae is discussed.

The pathology of abruptio placentae and the changes in the physiologic functions of the uterus in this condition, are considered.

A plea is made for earlier resort to cesarean section in cases of abruptio placentae.

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Bazan and Roth: Non-Surgical Parturition in Three Cases of Premature Partial Separation of the Normally Situated Placenta, Bol. Soc. de obst. y ginec. 13: 526, 1934.

The authors report three cases of premature separation of the placenta, treated by rupture of the membranes and injections of spasmalgin. The three babies died; the mothers recovered.

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STUDIES IN GLUTATHIONE

I. TOTAL AND REDUCED GLUTATHIONE, OXYGEN CONTENT AND CAPACITY, AND CELL VOLUME OF BLOOD IN NONPREGNANT AND PREGNANT WOMEN, WITH SPECIAL REFERENCE TO THE TOXEMIAS OF PREGNANCY

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RECENT evidence indicates that glutathione may be intimately concerned in intracellular oxidation because of its facility for taking up and liberating hydrogen. This substance is present in both the reduced and oxidized forms in various tissues and in red blood cells, but not in the plasma.

In view of Rodenacker's¹ findings that the oxidizing power of blood and presumably of the tissues decreases slightly toward the end of normal pregnancy, and in eclampsia falls far below the normal level, it seemed that blood glutathione studies combined with oxygen content and capacity determinations in such individuals might give valuable information. Deficient oxidation has been cited by Hochenbechler² as the cause of the lowered bicarbonate reserve of the blood in eclampsia, and Stander,³ in discussing the significance of increased lactic acid of the blood in eclamptic women, argued that whatever theory ultimately explains the etiology of this disease, decreased or deficient oxidation must be taken into account, since he considers this phenomenon the most fundamental yet discovered.

The purpose of the present study was to determine the concentrations of reduced and total glutathione, the oxygen content and capacity, and the cell volume in the blood of nonpregnant women, in normal women during pregnancy, labor and the puerperium, and in individuals suffering from the toxemia of late pregnancy.

SUBJECTS AND METHODS

Blood was obtained from 66 women, of whom 10 were nonpregnant (student nurses and patients on the gynecologic ward with no evidence of disease), 18 were in the late weeks of normal pregnancy, 10 were in labor, 10 were puerperal (four to ten days after delivery), and 18 were patients with toxemia of late pregnancy (8 had eclampsia).

The blood was drawn anaerobically under oil without stasis, and was analyzed immediately for total and reduced glutathione, oxygen content and capacity, and cell volume. Samples were taken both early and late in labor from each of the ten parturient women in order to ascertain the effect of the anesthetic, ethylene with

air or oxygen. Cord blood was drawn nearly simultaneously with the maternal specimen. The blood from the other groups was obtained while the individual was at rest (usually in bed) some hours after the ingestion of food.

The glutathione was determined by the method of Woodward and Fry,⁴ according to whom the only blood constituent to interfere is thioneine, which, by their estimate, would produce an error of approximately 3 mg. per cent in the glutathione values.

The cell volumes were determined in duplicate using the Plass and Rourke⁵ hematoocrit tubes* rotated at 3,200 r.p.m. for thirty minutes.

The oxygen content and capacity were determined by the manometric method of Van Slyke and Neill.⁶ The gas apparatus and technic of Van Slyke⁷ were used.

RESULTS

GLUTATHIONE

The average values for total and reduced glutathione in nonpregnant, pregnant and parturient women, and in those with the toxemia of late pregnancy, show minor variations (Table I), while the total glu-

TABLE I

THE AVERAGE VALUES OF TOTAL AND REDUCED GLUTATHIONE CONCENTRATION (MG. PER 100 C.C. BLOOD) WITH OXYGEN CONTENT AND CAPACITY AND CELL VOLUME FOR THE VARIOUS GROUPS OF PATIENTS STUDIED

SOURCE OF MATERIAL	NO. OF PTS.	CELL VOL- UME	GLUTATHIONE			OXYGEN		
			RE- DUCED MG. %	TOTAL MG. %	% IN REDUCED FORM	CON- TENT VOL. %	CAPAC- ITY VOL. %	SATU- RATION %
Nonpregnant	10	40.0	38.6	42.1	91.6	8.3	16.7	51.5
Late pregnancy	18	38.5	39.5	43.5	90.8	8.2	16.6	49.4
In early labor before anesthesia	10	39.4	35.1	38.6	91.0	9.2	17.2	53.5
In late labor during expulsion of fetus	10	40.6	37.6	40.8	92.0	13.3	18.3	72.6
Cord blood	10	52.5	50.3	55.8	90.2	12.0	23.1	51.9
Postpartum (4 to 10 days)	10	37.4	40.0	47.1	85.0	7.1	16.5	43.0
Toxemias of pregnancy*	10	39.7	36.7	43.5	84.4	11.5	18.2	63.2

*Four patients with eclampsia and six with nonconvulsive toxemia—See Tables II, A and B.

thione is slightly increased in the puerperal group. The range of values among toxemic patients, including those with eclampsia (Table II), was considerably greater than in other groups. The reduced glutathione concentration in normal individuals usually was more than 80 per cent of the total, but occasionally fell below this figure.

As compared with the first stage of labor, prior to administration of the anesthetic, blood taken at delivery showed an increase in the average total glutathione from 38.6 to 40.8 mg. per cent associated with increases in cell volume from 39.4 to 40.6 per cent and in oxygen capacity from 17.2 to 18.3 volume per cent. Since the changes are proportional and in the same direction, it is assumed that they are due to the blood con-

*These tubes are manufactured by Macalaster Bicknell Company, 40 Wendell Street, Cambridge, Mass.

centration which is known to occur under anesthesia late in labor. In patients four to ten days postpartum the total glutathione had increased from an antepartum average of 43.5 to 47.1 mg. per cent, even though the oxygen capacity was practically unchanged.

TABLE II
INDIVIDUAL DATA ON PATIENTS WITH TOXEMIA OF LATE PREGNANCY
A—ECLAMPSIA

CASE NO.	CELL VOL.	GLUTATHIONE			OXYGEN		
		REDUCED MG. %	TOTAL MG. %	PER CENT IN REDUCED FORM	CONTENT VOL. %	CAPACITY VOL. %	SATURATION %
17	34.2	----	----	----	13.3	14.8	89.8
77	38.2	18.7	29.0	64.5	14.4	17.3	83.2
80	39.9	33.0	40.2	82.0	12.9	18.2	70.8
84	39.0	51.6	62.2	83.1	9.4*	19.0	49.5
86	34.2	34.8	39.5	88.1	15.6	17.2	90.6
87	37.2	----	----	----	13.3	16.4	81.1
92	31.5	----	----	----	12.2	14.3	85.4
93	41.0	----	----	----	16.8	20.9	80.4
Aver.	36.9	34.5	42.7	79.4	13.5	17.3	78.8

*Conv. twelve hours previous to drawing of blood. Had received morphine.

B—NONCONVULSIVE TOXEMIAS

23†	38.0	----	----	----	11.6	19.7	58.8
44†	38.5	----	----	----	8.8	16.0	55.0
46†	38.5	----	----	----	13.0	17.6	73.8
73†	44.0	----	----	----	7.6	19.2	39.6
77†	41.5	30.2	34.2	88.3	7.8	18.4	42.4
82†	39.6	52.3	57.3	91.3	8.4	12.2	68.8
75‡	43.0	31.3	36.9	84.8	16.7	17.9	93.3
79‡	44.5	31.3	39.4	79.4	7.8	20.5	38.0
81‡	46.0	38.1	43.1	88.4	16.4	19.5	84.2
85‡	31.0	45.8	53.3	86.0	4.6	16.8	27.4
Aver.	40.5	38.2	44.0	86.4	10.3	17.8	58.1

†Preeclampsia. ‡Nephritic toxemia.

NOTE: The oxygen content of venous blood in patients with eclampsia is very much higher than in normally pregnant women. Glutathione values among the pregnant women with toxemias are more variable than among the normally pregnant women, even though the averages in the two groups are about the same.

Cord blood, having an average oxygen capacity of 22.1 volume per cent and a cell volume of 52.5 per cent, showed a total glutathione value of 55.8 mg. per cent, which represents approximately the same amount of glutathione per unit volume of cells as in the maternal blood.

OXYGEN CONTENT AND CAPACITY

The oxygen content of venous blood was more variable than any of the other constituents, although it was fairly constant among the nonpregnant and the normally pregnant, representing approximately 50 per cent saturation. Early in labor the percentage saturation rose slightly to 53.3 per cent, but by the time of delivery it had increased to 72.6 per cent, probably due largely to the oxygen administered with the

anesthetic, although the increased rate and depth of respiration may have been accessory factors. After delivery it returned in four to seven days to a low average level of 43 per cent. The cord blood was only 51.9 per cent oxygen saturated, probably because its oxygen content is maintained at approximately the maternal level even though its oxygen capacity is markedly increased by the high level of hemoglobin concentration.

It is noteworthy (Table II-A), that the oxygen content of the blood from eclamptic patients is very much higher than in normal pregnant women, the blood being from 70.8 to 90.6 per cent saturated with oxygen, except in Case 84 in which the sample was obtained twelve hours after the last seizure and following heavy doses of morphine. In three other patients (Nos. 17, 80, and 86), the specimens were drawn immediately following a convulsive attack. Patient No. 77, during the preeclamptic state, showed a blood oxygen saturation of 42.4 per cent, while two days later, forty-five minutes after a single convulsion, the blood was 83.2 per cent saturated with oxygen. Patients with nonconvulsive toxemias (Table II-B) showed marked variations in oxygen content and in the percentage of oxygen saturation. It is suggested that these variations may revolve around alterations in the respiratory and pulse rates.

DISCUSSION

These studies on blood glutathione do not support the contention of Rodenacker,¹ and Hochenbeehler,² which are discussed fully by Stander,³ that there is a consistently decreased or deficient oxidation in the body tissues of pregnant and toxemic women. The observed glutathione values in the toxemic patients studied do not vary from normal, thus confirming the recent evidence advanced by Stander⁴ from a study of six eclamptic women. In general the concentration of total and reduced glutathione varies directly with cell volume but is independent of blood oxygen saturation. In contrast with Standar's⁴ observation of a reduced blood glutathione in the early puerperium, our values four to ten days after delivery are higher than those obtained in the nonpregnant or in the late weeks of normal gestation.

The unusually high oxygen saturation of venous blood in eclamptic women may theoretically be due to a decreased or deficient oxidation in the body tissue, but the evidence here adduced argues against such an hypothesis. It is more probable that the rapid respiratory and pulse rates, observed in eclamptics account for the high oxygen saturation, while the high values for maternal blood at the time of parturition are probably due to the high oxygen concentration of the anesthetic mixture. The oxygen saturation of cord blood, drawn nearly simultaneously with the maternal blood at the end of parturition, is practically the same as that of maternal blood drawn early in labor. This might suggest that

oxygen is not readily transported through the placenta to the fetus, but it seems more probable that the low oxygen saturation percentage of fetal blood is related to its much greater oxygen capacity. The oxygen content of fetal blood at birth is slightly lower than that of the simultaneously drawn maternal blood, a variation which may be due to a "drag" in the transplacental passage of oxygen or to a more rapid utilization of oxygen by the fetal structures.

CONCLUSIONS

1. No essential differences in the average values of reduced and total glutathione were found among normal nonpregnant, pregnant, or parturient women. Puerperal women presented slightly higher total glutathione values. Patients with the toxemias of late pregnancy also showed values approximately within the normal range. Values of cord blood were significantly higher than those of maternal blood.
2. Insignificant variations in the percentage of oxygen saturation were noted in venous blood of nonpregnant, pregnant, and puerperal women. During delivery, when an anesthetic agent containing oxygen was administered, the average oxygen saturation was increased from 53.5 to 72.6 per cent.
3. In the nonconvulsive toxemias of pregnancy the oxygen saturation was variable but tended to be higher than in the normally pregnant group. In eight women with eclampsia, the average value for oxygen saturation of venous blood was 78.9 per cent; significantly higher than in any other group.

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TOTAL VERSUS SUBTOTAL ABDOMINAL HYSTERECTOMY IN BENIGN UTERINE DISEASE*

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THE subject of this discourse has been a controversial one for many years. On the one hand, a majority group of conservative pelvic surgeons has consistently maintained emphatic opposition to routine total abdominal hysterectomy, believing that this procedure is indicated only when subtotal hysterectomy does not suffice completely to eradicate uterine disease; while on the other hand, a minority group has vehemently contended that subtotal hysterectomy is in reality an inadequate and unsatisfactory operation to be resorted to only when confronted with exigencies that compel its adoption, since it leaves behind a cervical stump which they assert henceforth constitutes a perennial menace to its possessor.

Notwithstanding the fact that seven years ago I published, and have since actively sponsored, a simplified technic for total abdominal hysterectomy, I have repeatedly voiced my active alliance with the conservative majority in this controversy. But I am frank to confess that lately my own convictions became a bit unsettled through the cumulative influence of multiplying reports within recent years of a surprisingly large number of cervical stump cancers together with the fact that, because of these reports, a considerable number of eminent surgeons have been induced to adopt and advocate routine total hysterectomy. Consequently I was stimulated to undertake a comprehensive review of the literature in order to evaluate impartially the factual as well as the inferential data pertinent to this discussion. It is my purpose to present here only a brief synopsis of this study in hopes that it may prove helpful in bringing about greater unanimity, both of surgical teaching and practice as regards the preferential operative treatment of benign uterine maladies.

Perhaps the most cogent argument offered in support of their contention by the advocates of routine total hysterectomy is the apparent steadily mounting incidence of cervical stump cancer. Judging from my own observations alone, extending now over a period of twenty-five years of active clinic work and private practice, I would unhesitatingly conclude that the occurrence of stump cancer is so rare as to be a

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negligible factor in this discussion. Consequently, great indeed was my surprise to learn from a recent publication by Von Graff that he had been able to assemble nearly twelve hundred cases, two-thirds of which have been reported within the last twelve years. Certainly, therefore, cancer of the cervical stump can no longer be considered a rarity. Unfortunately, it is impossible to determine with any degree of accuracy its absolute incidence, because no one has the remotest idea how many thousand subtotal hysterectomies have been performed the world over to produce twelve hundred instances of stump cancer. Nor, on the other hand, is it at all probable that this number represents the total incidence, since scattered cases must have been observed here and there which have never been reported. The average incidence subsequent to approximately ten thousand subtotal hysterectomies reported by a dozen different authors is a little less than 1 per cent. But in a study at the Hopkins Clinic just completed and not yet published Erle Henriksen found among 940 cases of cancer of the cervix an incidence of 2.3 per cent of stump cancer. In some other statistical reports of the same kind this percentage is considerably higher, the average being around 4 per cent. Curiously enough, in the literature on cervical stump cancer both from American and European sources one repeatedly encounters the testimony of men who for years have been either at the head of or closely identified with large and active gynecologic clinics that they have never seen a single case of stump cancer. Such wide statistical variations are to be explained probably by the fact that within recent years most of the cervical cancer cases have been referred for treatment only to institutions which are adequately equipped for irradiation therapy. All factors considered, I do not believe that the actual incidence of stump cancer the world over today exceeds 3 per cent.

In this connection it is important to consider the time interval between the performance of subtotal hysterectomy and the subsequent appearance of stump cancer. Most writers upon the subject have arbitrarily assumed that all cancers becoming manifest within one year were present and overlooked at the time of the operation. Now over 20 per cent of the cases fall into this category. The remainder, constituting more than three-fourths of the total incidence, have developed after periods of from one to twenty years and all of these, according to the claims of its advocates, would have been saved by routine total hysterectomy. Obviously this assertion is entirely unwarranted, since not only does it inaccurately assume that the more radical operation as performed by the average surgeon carries with it no mortality whatsoever, but also it utterly ignores authentic reports of a score or more of vaginal vault cancers which developed subsequent to total hysterectomy, thus proving conclusively that even this procedure does not afford absolute protection.

But the major fallacy in the argument of those who contend that the present incidence of stump cancer is itself reason sufficient for the universal adoption of routine total hysterectomy is the significant fact that absolutely no data are available for determining the condition at the time of the original operation of those cervices in which cancer later developed. It is fairly safe to assume that most of them occurred in cervices which at the time of the subtotal hysterectomy presented the familiar picture of old lacerations, hypertrophy, so-called erosion and chronic infection. Certainly it would be very easy to build up convincing circumstantial evidence in support of this assumption. Indeed one of the most striking and convincing facts established through statistical studies on cancer of the cervix is that the incidence of this disease subsequent to complete eradication of benign cervical lesions is almost negligible. And if this be true, the incidence of stump cancer should be construed not as a compelling reason for the universal adoption of routine total hysterectomy, but rather as an index both of reprehensible neglect in the postoperative treatment of diseased cervical stumps and of the unfortunate choice of cases suitable for subtotal hysterectomy. This latter operation is properly applicable to only four types of cases: (1) to those women requiring hysterectomy for benign disease who possess perfectly normal cervices; (2) to cases where the operative hazard compels the execution of rapid and conservative surgery; (3) to a few cases where for good and sufficient reason it is of paramount importance to preserve the function of menstruation; and (4) to most cases requiring hysterectomy during pregnancy. Before deciding upon subtotal hysterectomy, therefore, it is incumbent upon the surgeon to scrutinize the cervix with particular care, making use not only of intelligent palpation and accurate inspection of it but also utilizing freely such diagnostic aids as the colposcope, the Schiller test, biopsy, and diagnostic curettage. Furthermore, remembering how frequently coexisting carcinoma at and above the level of the internal os is overlooked, the body of the uterus immediately upon its removal by subtotal hysterectomy should be laid wide open so as to permit accurate inspection of every centimeter of the endometrium; likewise all fibroid tumors should be bisected and carefully examined and an immediate frozen section report should be obtained from any suspicious areas. There is scant likelihood that stump cancer will later develop in any cervix which survives the rigid application of these tests.

Much has been written concerning the predisposing influence upon the development of cancer of the uterus which appears to reside in fibroid tumors. Of course it has long been known that with at least 3 per cent of them there coexists malignant disease in the form of adenocarcinoma of the uterine cavity, sarcomatous degeneration of the fibroid tumors themselves or cancer of the cervix. But recent statistical studies

of uterine cancer reveal the striking fact that cancer of the body occurs nine times and cancer of the cervix four times oftener in association with fibroid tumors than is the incidence in otherwise normal uteri. Moreover, fully two-thirds of the cases of stump cancer thus far reported have followed subtotal hysterectomy for fibroid tumors. Here it should be recalled that there is uniformly associated with fibroid tumors a marked grade of hypertrophy and hyperplasia of the endometrium and that according to some pathologists, the squamous epithelium of the cervix exhibits similar signs of growth activity. Evidence is accumulating which shows an enormous concentration of the ovarian hormone folliculin in fibroid tumors, a fact which strongly supports the speculative assumption that such colossal cell proliferation as is exemplified in a rapidly growing fibroid tumor, and contemporaneously both in the hyperplasia of the endometrium and possibly also in the squamous cells covering the portio vaginalis, must be the direct result of sustained and powerful stimulation of a growth hormone. Whether or not such dysfunctional hormonal influence is responsible for an epithelial transition particularly favorable to the later development of cancer is but one of a number of related problems that await solution through the energetic and untiring efforts of our esteemed research colleagues.

The practice of coring out the mucous membrane of the cervical canal at the time of subtotal hysterectomy or destruction of it by heat applied in one form or another has been emphasized by some surgeons and adopted by a considerable number as a reliable safeguard against the subsequent development of stump cancer. But when it is recalled that more than 80 per cent of all cancers of the cervix originate from the squamous epithelium of the portio vaginalis it becomes evident that this procedure has only a meager prophylactic value. On the other hand, the majority of stump cancers appearing within one year after subtotal hysterectomy are adenocarcinomas, and since these are assumed to coexist at the time of the operation, it becomes evident that the block of cored out cervical tissue possesses particular value for immediate biopsy by the frozen section technic.

Two other points of practical importance appear to have been established through statistical studies which need to be emphasized because they are in conflict with prevailing surgical opinion; (1) that approximately 10 per cent of these stump cancers occur in women from twenty to thirty-five years of age; and (2) that over 20 per cent of these women have never been pregnant.

The latter point serves to focus our attention sharply upon the possible rôle which chronic infections of the cervix play in the etiology of cancer, since a considerable proportion of stump cancers follow subtotal hysterectomies performed because of the late consequence of uterine and adnexal infections. Furthermore, it has been abundantly demon-

strated that such infected cervices are etiologically responsible for at least a small proportion of the cases of infectious arthritis. Chronic leucorrhea, which is so prevalent as to be accorded but scant consideration by the average doctor, is the sign that points unmistakably to the existence of these lurking menaces. Consequently, the teaching of those who emphatically condemn subtotal hysterectomy in the presence of chronic infection of the cervix is unquestionably sound.

Conspicuous in all of the discussions upon the universal adoption of routine total as distinguished from elective total hysterectomy has been the question of relative mortality. Unfortunately, on this phase of the subject statistics prove their own unreliability. Where they represent the operative results of highly trained, experienced and skillful surgeons the percentage difference in mortality between the two operations is so small as to represent only the accidents common to all branches of major surgery. In such hands the mortality in either group does not exceed 1.5 per cent. But, according to the statistics of Fullerton and Faulkner based on 1,851 consecutive hysterectomies, where the figures apply to the average run of an active clinic in which the routine operating over a period of years has been participated in by a score or more of individuals, including senior residents who have not yet completed their apprenticeships, the gross mortality in both types of hysterectomy is 4 to 4.5 per cent. Note, however, that in 63 per cent of 1,078 total hysterectomies performed by five members of the visiting staff the mortality was 3.5 per cent; while in 37 per cent performed by twenty members of the resident staff the mortality was 5.2 per cent. These figures indicate clearly enough what would happen if inexperienced pelvic surgeons everywhere undertook the routine performance of total hysterectomy.

Furthermore, comparison of mortality statistics alone by no means tells the whole story. Certainly consideration of postoperative complications and of morbidity should not be omitted when one undertakes to evaluate the relative merits of two operative procedures. Notwithstanding this fact, there is a striking and disquieting paucity of data in the literature relating to this vitally important phase of the subject. But from my own observation and experience I have no hesitancy in asserting that if such specific tests as the incidence of operative and postoperative hemorrhage, surgical shock, damage to bladder, ureters and rectum with consequent fistula formation, postoperative cystitis, pelvic cellulitis, peritonitis, intestinal obstruction, wound infections, phlebitis, thrombosis and embolism, pneumonia, sustained daily elevation of temperature above 100° and total duration of convalescence were rigidly applied, it would be exceedingly difficult to justify the advocacy of universal routine total hysterectomy. Unquestionably this is a surgical procedure of far greater

magnitude requiring larger experience and more highly developed technical skill for its successful application than does subtotal hysterectomy.

A discussion of vaginal hysterectomy does not come within the scope of this paper and I refer to it only to emphasize the fact that in properly selected cases it possesses distinct advantages over both total and subtotal hysterectomy performed by the abdominal route.

From what has been said it is apparent that the advocates of routine total hysterectomy offer three major arguments in support of their contention; (1) the present incidence of stump cancer; (2) the prevalence of focal infections in the cervix; and (3) the assertion that the difference in mortality between total and subtotal hysterectomy is so slight as to be a negligible factor.

Opposing conservative opinion, on the other hand, contends that the incidence of stump cancer should be interpreted merely as an index of the ill-advised use of subtotal hysterectomy or of neglect in the subsequent eradication of benign cervical stump lesions, since one cannot discover in the recorded data any evidence that normal cervices later become cancerous; (2) that in the hands of the average operator total hysterectomy is unquestionably a more hazardous undertaking and is attended by a substantially higher mortality than is the subtotal operation; and (3) that likewise panhysterectomy involves far greater risk of serious operative and postoperative complications, as well as a longer period of morbidity, than does the supracervical technic.

Finally, no one can review the voluminous literature on this subject without being profoundly impressed by the continued reprehensible prevalence of benign diseases of the uterine cervix and their undoubtedly etiologic relationship to cancer. It is encouraging, however, to note that there now appears to be a real awakening of interest in this matter and that obstetricians generally are beginning to realize the importance of puerperal gynecology. Recent reports from some of our best obstetric clinics reveal that late follow-up examinations disclose unsatisfactory conditions of the cervix and lower birth canal in from 50 to 75 per cent of women who have borne one child or more. And if this be true of the work of expert obstetricians conducted under the most favorable conditions, one can readily understand why it is exceptional to find a normal cervix in conjunction with the indications for hysterectomy. Consequently, despite its many advantages, it is lamentably true that conservative subtotal hysterectomy has today only a limited field of application. And it was recognition of this situation coupled with unsatisfactory experiences with the older operations that led me tediously to develop and seven years ago to publish^{1, 2} my simplified technic for abdominal total hysterectomy designed specifically to guard against the major hazards incident to this procedure; namely, mortality, hemorrhage,

shock, damage to ureters, bladder and rectum, and postoperative peritonitis. Thus far in my own series, which as yet totals not quite one hundred cases but which embraces every variety of both simple and complicated pathology requiring this type of surgical therapy, none of these hazards has materialized. Therefore, I can with great confidence heartily recommend this simplified technic to other surgeons who, like myself, have found the older operations formidable and unsatisfactory.

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9 EAST CHASE STREET

A REVIEW OF 190 CASES OF HEART DISEASE
COMPLICATING PREGNANCY*

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THIS paper represents a study of 190 cases referred to the Cardiac Clinic of the Los Angeles Maternity Service during the years 1931, 1932, and 1933. These cases represent Negroes, Mexicans, and Caucasians, most of which are of the lowest social order, and, as may be imagined, a great number of these have a very low intelligence quotient. Therefore, it gives an idea of what may be expected from cardiac supervision of cases of this type.

The method of study is as follows: The patient is referred to us because routine examination disclosed a murmur, apparent enlargement, or history of heart disease. A careful history is taken for possible etiology, and she is questioned as to previous evidence of heart disease and the severity of manifestations prior to pregnancy. She is then examined, classified, and instructed as to what change, if any, is necessary in her mode of living. If history and physical examination are not sufficient for diagnosis, she is sent to the General Hospital for orthodiagram, E.K.G., and whatever laboratory work may be necessary.

If the diagnosis is functional heart disease she is returned to her original clinic with instructions to be sent back to us if additional symptoms appear. If organic heart disease is diagnosed, etiologic and structural type is recorded, and she is classified as to function, according to the ability of the heart to withstand ordinary physical activity of the housewife. Class I includes the women able to carry on this work without symptoms. Class II-A are those who are slightly limited, and

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Class II-B those who are greatly limited in their ordinary activities. Class III includes those who are able to do no work, or have failure when at rest.

The difficulties encountered in the diagnosis of heart disease in the pregnant woman are increased by several factors, among them being the more rapid heart rate, increased general weight, increased size of hearts, and raised diaphragm with rotation and displacement of the heart. Also many normal pregnant women complain of dyspnea on exertion, fatigue, palpitation and swelling of the ankles. Thus, if murmurs and abnormal valve sounds are present, the patient may show objective and subjective signs of heart disease and still have a normal heart.

This series, comprising 190 cases, was referred to the cardiac clinic from a total of 14,700 seen in the general service. Of these, 125 were classed as functional and 65 as organic. This represents an incidence of 0.44 per cent for the organic group and 0.85 per cent for the functional group. This is a much lower incidence than that of similar groups reported from eastern hospitals.

Let us consider the functional type first. One hundred and six of these showed functional murmurs. These appear as systolic murmurs of all degrees. Most often they are heard over the mitral area, but may be heard over the pulmonic area or both areas. In this series, 52 showed murmurs heard best in the mitral area, 38 in the pulmonic area, and 16 in both areas. Many also showed a very loud third sound, the frequent occurrence of which could not be explained.

The balance of the functional cases consisted of those with histories of frequent palpitation, tachycardia, either paroxysmal or of considerable duration, frequent premature beats, and those who had been told they had heart disease because murmurs had been found in the past, but who had none when examined by us.

The organic group of 65 is for the most part made up of cases of rheumatic heart disease. In it are 49 cases of mitral stenosis, 3 of mitral regurgitation, 1 mitral stenosis plus aortic regurgitation, 1 aortic regurgitation, 2 hypertensive hearts, 2 of syphilitic heart disease, one patent ductus arteriosus, 3 thyroid hearts and one case of hyperthyroidism superimposed on an old rheumatic mitral stenosis of mild degree. We also include in this group 2 myxedema hearts. Thus, as in other series reported, rheumatic heart disease accounts for by far the greater number of cases giving trouble during pregnancy.

In this group, 14, or 21 per cent, had a history of previous failure, and 21, or 32 per cent, had some degree of failure before term. However, failure was usually detected early, and most cases were carried successfully to term. Of the 14 patients who had had previous failure, 7 developed failure before term. The rheumatic hearts accounted for all of the failures except 5. But in terms of percentage, the incidence of failure in the nonrheumatic group was high. One of the thyroid hearts failed and another patient had a thyroidectomy at four and one-half months because of progressive increase in symptoms. The rheumatic plus thyroid case accounted for one of our deaths. One of the 2 hypertensive hearts and both of the syphilitic hearts developed failure. The myxedema hearts, as was expected, improved under treatment and followed uneventful courses.

All of the patients with organic heart disease are examined every two weeks. Pulse rate and blood pressure are taken, and the patient is examined physically. The earliest signs of failure should be recognized. These are, in our opinion, persistent râles at the bases of the lungs and an increase in pulse rate. Changes

in respiration, cyanosis and edema appear later. We feel that the foregoing observations on a patient, with which one is familiar, are of more value than standardized effort tests, and determination of vital capacity in determining when the heart is reaching the limit of its reserve. Reduction of activity or absolute rest is ordered on the impression that the patient gives following physical examination and questioning as to the amount of physical effort indulged in since the last visit, and her reaction thereto.

The progress of the patient under observation, as well as age, pelvic measurements, number of previous pregnancies and behavior in them all enter into recommendations for delivery. When the cardiac reserve is well maintained and measurements normal, she may even be delivered at home, but when the reserve is low, it is recommended that she be hospitalized for delivery.

Of these 65 cases of organic heart disease complicating pregnancy, it has been possible to get complete records on 53, 81 per cent. These are divided as follows: Class I, 15 cases; Class II-A, 18 cases; Class II-B, 19 cases; Class III, 1 case.

There were 12 patients delivered in their homes and 41 in the General Hospital. A follow-up on all of these cases was made from six weeks to three years postpartum. In Tables I to IV the cases are separated into primiparas and multiparas for purposes of comparison as to the length of labor, methods of delivery, and weight of the baby. Practically all patients had some type of analgesia during labor.

TABLE I. CLASS I

	PRIM.	MULT.
Cases	6	9
Type of Delivery		
Spontaneous	5	8
Low forceps	1	0
Version extraction	0	1
Av. length first stage	8.5 hr.	8.5 hr.
Av. length second stage	1.5 hr.	0.5 hr.
Av. weight of baby	6.5 lb.	7.5 lb.

Class I, of course, represents the most favorable type of organic heart disease complicating pregnancy. All these cases were delivered through the birth canal. All patients were discharged in good condition and were found to be in good condition in the follow-up.

TABLE II. CLASS II-A

	PRIM.	MULT.
Cases	5	13
Type of Delivery		
Spontaneous	3	8
Low forceps	1	0
Midforceps	1	0
Version extraction	0	1
Cesarean section	0	4
Av. length first stage	14.0 hr.	7.5 hr.
Av. length second stage	0.75 hr.	0.75 hr.
Av. weight of baby	7 lb.	8 lb.

All patients in Class II-A were discharged in good condition. One patient showed evidence of heart failure in the follow-up.

All primiparas in Class II-B who were delivered were discharged in good condition. One showed evidence of heart failure in the follow-up. One primigravida died undelivered. Of the multiparas, ten were discharged in good condition, one died four days postoperative. On the follow-up eight were in good condition and two showed evidence of heart failure.

The patient in Class III left the hospital in fair condition, but died four months postoperative.

TABLE III. CLASS II-B

	PRIM.	MULT.
Cases	8	11
Type of Delivery		
Spontaneous	4	8
Version extraction	1	0
Cesarean section	2	3
Died undelivered	1	0
Av. length first stage	7.5 hr.	9.5 hr.
Av. length second stage	0.75 hr.	0.75 hr.
Av. weight of baby	5.5 lb.	6.5 lb.

TABLE IV. CLASS III

	PRIM.	MULT.
Cases	0	1
Type of Delivery		
Cesarean section	0	1

TABLE V. SUMMARY OF DELIVERIES

Total number of cases	53
Methods of Delivery	
Spontaneous	36
Low forceps	2
Midforceps	1
Version extraction	3
Cesarean section	3
Cesarean section and sterilization	6
Cesarean section and hysterectomy	1
Died undelivered	1

TABLE VI. ABDOMINAL DELIVERIES

AGE	PARA	INDICATION	ANESTHESIA
39	ii	Previous section and heart	Ethelene
24	0	D. D. S. and heart	Local
35	v	Decompensated heart	Local
20	i	Previous section and heart	Local
30	iii	Toxemia of pregnancy and heart	Spinal
31	0	Ankylosis of hip and heart	Ethelene
28	i	Decompensated heart	Ethelene
41	i	Essential hypertension and heart	Ethelene
25	ii	Heart failure	N ₂ O-Ether
25	i	Previous section and heart	Ethelene

Of the methods of delivery, 10 patients required abdominal section, 7 of which were sterilized. Two primiparas were not sterilized because it is against the policy of the Hospital to sterilize at the first operation unless there are grave reasons. One multipara was not sterilized due to refusal to sign the consent.

No complications developed with the patients shown in Table VI terminated through abdominal surgery. Nine patients were discharged in good condition and one in fair condition.

MORTALITY

There were three deaths in this series, giving a mortality rate of 5.5 per cent. A brief summary of each case follows:

CASE 1.—White, aged thirty, para 0, gravida ii; patient first seen in Maternity Clinic Feb. 2, 1933 when about six months pregnant. Past history reveals one spontaneous abortion at four and a half months in 1930; diphtheria and measles in early childhood, influenza in 1918; patient also stated that she had had a paralytic stroke in 1932 but had made a complete recovery shortly thereafter.

Physical examination showed all findings to be within the range of normal except a heart condition which was described in Heart Clinic as advanced mitral stenosis. Patient was advised to take rest periods both morning and afternoon and was given one grain pulverized digitalis each day. Patient seen again at Maternity Clinic on Feb. 17, 1933, at which time she showed evidence of congestive heart failure, and was admitted to the Medical Service at General Hospital the same day, for observation. Patient treated with absolute bed rest, digitalis, and sedatives. However, she made only slight improvement and on February 27 had a sharp pain in her chest after which she became cyanotic and died. There was no autopsy. It was the impression of her attending physician that she had had a pulmonary embolus.

CASE 2.—White, aged forty, para v, gravida ix; first seen in Maternity Clinic June 6, 1931. Past history reveals all previous deliveries to have been spontaneous and three spontaneous abortions. Patient had a thyroidectomy in 1919. She had been well until her last pregnancy in 1927 when there was evidence of heart failure.

Physical examination showed some exophthalmos, a large adenoma of the thyroid, heart was fibrillating, and there was moisture in the bases of both lungs; pregnancy was advanced to about six lunar months. Patient was admitted to the General Hospital immediately, with a diagnosis of recurrent thyrotoxicosis and cardiae decompensation complicating pregnancy. She was treated on the Medical Service and improved under treatment until July 1, 1931, at which time her heart had compensated, and it was felt best to terminate the pregnancy. This was attempted by castor oil, quinine, and nasal pituitary pack, which was unsuccessful. On July 3, a Voorhees' bag was inserted and was expelled twenty-four hours later, followed by a two-pound eight-ounce fetus. Patient went into immediate shock with considerable hemorrhage. It was the opinion of the attending physician that she probably had a ruptured uterus so a laparotomy was advised. A hysterectomy was performed under local anesthesia. There was no evidence of a uterine rupture. Patient was treated for shock by transfusion but died five days later from cardiae decompensation.

CASE 3.—White, aged twenty-five, para i, gravida ii; first seen at Maternity Clinic Jan. 30, 1931; had had a previous cesarean section in 1929 on account of cardiac condition. Past history revealed repeated attacks of rheumatism.

Physical examination revealed a pregnancy of about six lunar months and heart findings which were described at Heart Clinic on Feb. 6, 1931, as far-advanced mitral stenosis with early signs of heart failure. Patient was put to bed at home for

six weeks, during which time her heart condition improved. She was seen again at the Clinic at weekly intervals from April 2 to May 5, at which time a cesarean section and sterilization was done at the onset of labor. Patient was discharged from the hospital fourteen days postpartum in fair condition, and was seen again in the Clinic on May 28, 1931, at which time she showed considerable edema of both ankles and complained of dyspnea. Bed rest was advised, and she improved and was up and about two weeks later, however, still complaining of shortness of breath. She suddenly died Sept. 2, 1931; death probably due to pulmonary embolus.

SUMMARY

1. A large series, with very low incidence of organic heart disease is reported. We believe that this is due to the small amount of rheumatic fever seen in Southern California.
2. Of these 190 cases, 65 were organic hearts, of which number we were able to get complete records on 53, or 81 per cent.
3. Of these 53 cases of organic heart disease, spontaneous delivery occurred in 68 per cent; forceps delivery in 5.6 per cent; version extraction in 5.6 per cent; cesarean section in 18 per cent. One patient died undelivered. There were two other deaths in this group, making a mortality rate of 5.6 per cent.
4. We believe that careful supervision is of great value in heart disease complicating pregnancy, and with such supervision it does not constitute a serious complication.
5. Abortion was not advised on any cardiac case seen in the Maternity Clinic during this time.

The authors wish to thank Dr. Lyle G. McNeile, Director of the Los Angeles Maternity Service, for permission to use the records.

Mascall, W. Neville: The Pathological Diagnosis of Female Gonorrhea, Lancet 2: 233, 1933.

The author employed smears, cultures, and complement fixation tests in 500 consecutive cases of gonorrhea to determine the relative value of each diagnostic method.

The "smears" were taken from the urethra and cervical canal and stained according to Jensen's modification of Gram's stain. Only 9.8 per cent of the 500 patients "were positive in smears only." Urethral and cervical cultures were taken routinely on hydrocele agar (pH 7.5), which was previously warmed to 37.5° C. and then incubated at this temperature. Oxidase reactions helped to locate gonococcal colonies. Cultures alone were positive in 31.2 per cent.

The percentages of positives for cultures, fixation tests and smears were 66.8, 58.6, and 45.4 per cent, respectively.

In doing the complement fixation tests, cross-fixation reactions are rare but possible. This test may be positive for three or four months after a clinical cure or may not become positive if treatment is begun early in the disease. By using all three methods, however, only a minimal error will exist, especially since the diagnosis should not be established by the clinical appearance alone. Positive smears and/or cultures are dependable.

H. CLOSE HESSELTINE.

THE PRIMIPAROUS PERINEUM AFTER FORCEPS DELIVERY*

A FOLLOW-UP COMPARISON OF RESULTS WITH AND WITHOUT EPISIOTOMY

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SINCE episiotomy was first suggested by Ould in 1742 this procedure has been the subject of controversy. The first favorable notices came from Michaelis in 1799. Carl Braun gave the operation its name in 1857 only to condemn it as inadvisable and unnecessary. Anna Broomall brought the procedure to American attention in 1878. Stahl in Chicago used perineotomy extensively during the last years of the nineteenth century. In Philadelphia, Barton Cooke Hirst was an early advocate of episiotomy in selected cases. Brooke Anspaeh's paper in 1915 introduced a series of discussions ending temporarily in Pomeroy's presentation before the American Gynecological Society in 1918. Among the adamant opponents of perineotomy, J. Whitridge Williams was the most outstanding.

Cameron has described episiotomy as "the substitution of a clean cut of definite size where it can do no harm, for a ragged tear of indefinite size where it may cause immediate harm and subsequent injury." In this paper the term episiotomy is used in its broader sense to include all the forms of perineal dissection.

Opinions for and against episiotomy have been formed on the basis of individual experience, but no statistical evidence has been compiled to support the claims of either side. It is the purpose of this paper to analyze the immediate and late results of forceps delivery in 202 primiparas at term, to compare the results with and without episiotomy, and to suggest the need for further study in certain subgroups. In this series those patients were subjected to episiotomy in whom the obstetrician thought a second-degree or greater laceration was unavoidable. Conversely, in those patients delivered without episiotomy no major lacerations were expected. The deliveries, with very few exceptions, were done by internes and residents under supervision. We feel that the results should represent those of the average physician working under optimum hospital conditions.

The general comparison of the two groups shows 130 cases with episiotomy as opposed to seventy-two cases without episiotomy. The age range and average age are entirely comparable. As might be expected

*Read at a meeting of the Obstetrical Society of Philadelphia, March 7, 1935.

TABLE I. GENERAL COMPARISON OF THE TWO GROUPS

	WITH	WITHOUT
Number of cases	130	72
Age range	15 to 37	13 to 31
Average age	21.5	21.1
Average duration first and second stages	18 hr. 6 min.	13 hr. 54 min.

the duration of labor is longer in the group subjected to episiotomy. This confirms the indications for episiotomy and the more frequent incidence of complicated operative obstetrics shown in Table I.

TABLE II. TYPES OF FORCEPS DELIVERY

	WITH	WITHOUT
Midforceps	9.2%	4.2%
Bill maneuver	3.1%	0.0%
Scanzoni maneuver	3.8%	4.2%
After-coming head	2.3%	1.4%
Low forceps	81.6%	90.2%

Of the low-forceps deliveries the large majority in both groups were "prophylactic."

TABLE III. MORBIDITY (OLD BRITISH STANDARD)

Total morbidity (entire group)	21.8%	WITH	WITHOUT
Total morbidity	25.4%	15.2%	15.2%
Low forceps alone	25.0%	17.0%	17.0%
Morbidity (pyelitis excluded)	20.5%	13.9%	13.9%

The combined morbidity of both series compares favorably with Stander's total morbidity of 35.4 per cent in 1,000 cases of forceps delivery. There were no maternal deaths in this series. A comparison of our two groups shows a decided increase in the morbidity in the episiotomy series. We have tried to explain this increase upon the basis of the difference in complicated operative incidence, the difference in incidence of intercurrent infection, and the difference in duration of labor. Plass reports a morbidity of 29 per cent in low forceps, 42.2 per cent in mid-forceps and 50 per cent in high forceps. In our series the comparative morbidity of low forceps alone corresponds to the general morbidity in each of entire groups. We had nine cases of pyelitis in the combined groups, seven of which followed the delivery of patients who had been victims of a grip epidemic current during February and March, 1934. Elimination of this single factor of intercurrent infection brought the morbidity in the two groups to 20.5 per cent with episiotomy and 13.9 per cent without.

TABLE IV. EFFECT OF DURATION OF LABOR ON MORBIDITY

	WITH	WITHOUT
Up to 10 hr.	20.9%	18.7%
10 to 20 hr.	27.2%	20.0%
20 to 30 hr.	29.2%	0.0%
30 hr. and up	27.7%	0.0%

Although the morbidity in prolonged labor is higher than in short labor, the same disproportion in favor of the series without episiotomy is present. Considering the morbidity from these three prime angles we must conclude that there is a substantial increase in morbidity attributable to episiotomy.

Episiotomy includes many types of perineal incision. In 1836, von Ritgen advocated many small incisions in the perimeter of the vaginal ring. DuBois in 1847 is credited with first suggesting the oblique incision now known as the mediolateral episiotomy. It was in Gustav Braun's clinic in Vienna that Broomall observed and reported the use of median episiotomy. In 1895, Dührssen introduced the lateral episiotomy favored by Seanzoni.

In our technie the perineum is first thoroughly "ironed out" manually, the forceps are applied and the head drawn against the perineum firmly. Pomeroy called attention to the danger of producing a laceration before episiotomy was done either by waiting too long or by pulling too firmly against the perineum. The incision is made with blunt scissors, severing the perineal structures as deeply as seems necessary to permit delivery of the head without further laceration.

TABLE V. EXTENSIONS

Mediolateral episiotomy		84.6%
Sulcus	8.2%	
Third degree	0.9%	
Median episiotomy		15.4%
Sulcus	5.0%	
Third degree	10.0%	

In 84.6 per cent of the cases mediolateral episiotomy was done. That oblique was elected in which the long axis of the head lay, i.e., right oblique in L.O.A., etc.; 15.4 per cent of cases were subjected to median episiotomy or, more properly, perineotomy. In the mediolateral group (110 cases) 8.2 per cent of cases showed an extension of the incision into the sulcus, while 0.9 per cent showed an extension which involved the sphincter. In the median group (20 cases) 5 per cent showed extension of the episiotomy into the sulcus and 10 per cent showed a third-degree laceration. By definition, in our clinic, any laceration which involves the sphincter, even though only the sphincteric fascia is injured, is designated a third-degree laceration. In none of the cases listed did the laceration extend into the rectal mucosa. This series is too small to be conclusive, but it supports the widespread belief among the profession that if a major laceration is unavoidable it is much safer to elect a mediolateral episiotomy, despite the protection offered by the Pomeroy technie of ironing out the sphincter and placing a mattress suture just above it. The mediolateral episiotomy is more difficult to repair, but as our experience grew the results became entirely comparable.

There are more methods of repair than there are episiotomies. In our clinic two were used. Most frequently a continuous vaginal suture with interrupted sutures in the perineal body where necessary and subcuticular skin closure were used. In cases where unusual trauma, excessive edema of the tissues, or both occurred, interrupted sutures were used throughout. In both methods No. 2 chromic catgut was the only suture material employed. In the series there was one perineal breakdown requiring secondary suture. This occurred on the fourth postpartum day in a patient in whom the interrupted method had been employed. The secondary repair was done on the eighth postpartum day with interrupted silkworm gut sutures.

The lacerations produced in those patients in whom no episotomy was done, follows:

TABLE VI

"None"	37.5%	Second degree complicated	4.2%
First degree	23.7%	With anterior wall laceration	2 cases
Second degree	27.8%	C. bilateral sulcus laceration	1 case
Third degree	1.4%		
Anterior wall	5.4%		

Williams acknowledges 66.6 per cent of lacerations involving the fourchet in primiparas. Polak in his series found pelvic floor injuries in 34 per cent of primiparas. The chart from our series indicates the known amount of damage found at examination immediately after delivery. As we shall show later, this by no means indicates the true amount of injury. Attention is called to the anterior wall lacerations. These did not occur in the series in which episiotomy was done. The episiotomies and lacerations represent the immediate perineal results of forceps delivery.

In the consideration of the late perineal results of both groups we have used the word perineum in its broadest sense to include three elective anatomical divisions, the anterior and posterior vaginal walls and the outlet. All examinations on which the subsequent report is based were made six weeks postpartum, in as critical a manner as possible by a single examiner. For purposes of classification the results were grouped under three grades.

Grade A, that pelvic floor and perineum which in the judgment of the examiner six weeks postpartum represented as complete a *restitutio ad integrum* as it was possible to attain. Many of this group showed minor relaxations but there was no gaping of the vulva and no bulging of the anterior and posterior vaginal walls on straining.

Grade B, that pelvic floor and perineum which showed a minor failure of restoration in one of the anatomical divisions with good results in the other two.

Grade C, that pelvic floor and perineum which showed a minor failure of restoration in two anatomical divisions, or a major failure in any one of them.

The results are as shown in Table VII.

TABLE VII

	WITH	WITHOUT
Grade A	73.9%	55.6%
Grade B	24.6%	34.7%
Grade C	1.5%	9.7%

This analysis is revealing particularly in the comparison of the Grade C or definitely unsatisfactory results. Grade B is equally important when we consider that in succeeding pregnancies these minor injuries are bound to be increased.

Study of the symptomatic evidence of injury immediately after delivery showed 13 per cent of bladder symptoms in the series with episiotomy as opposed to 16.6 per cent of bladder symptoms in those without it, eliminating pyelitis and cystitis of infectious character from both series. No satisfactory criteria of symptomatic evidence could be established for vaginal outlet and posterior wall study.

Analysis of the results in the three elective anatomical divisions was interesting in its support of episiotomy. In Table VIII the heading "relaxation" appears. In many cases there was a demonstrable anatomic injury which though definite was not sufficient to produce cystocele or rectocele, etc. This type of injury is termed "relaxation."

TABLE VIII

Anterior Wall:	WITH	WITHOUT
Relaxation	13.1%	16.6%
Small cystocele	7.7%	15.3%
Large cystocele	1.5%	8.5%
High cystocele	0.7%	0.0%
Totals	23.0%	40.4%

The immediate results of delivery without episiotomy showed the presence of anterior wall lacerations which did not occur in the episiotomy series. We consider the late results of anatomical analysis to support the opinion that the vagina must be considered as a tube, that despite its more adequate bony support, there is a large percentage of anterior wall injury, and that episiotomy reduces the amount of that injury to a minimum by relieving the strain on the outlet of the tube. High cystocele and high rectocele are produced in the last part of the first and early part of the second stages of labor. We consider that the presence of such a lesion in the episiotomy series is merely indicative of the more difficult parturition in the episiotomy group.

TABLE IX

	WITH	WITHOUT
Posterior Wall:		
Relaxation	7.7%	11.1%
Small rectocele	3.1%	12.5%
Large rectocele	2.3%	4.2%
High rectocele	0.7%	0.0%
Totals	13.8%	27.8%

These results are interpreted to mean two things. In episiotomy the extent of injury is more easily determined and the damage done is more readily repaired.

TABLE X

	WITH	WITHOUT
Outlet:		
Slight R.V.O.	7.7%	19.4%
Marked R.V.O.	6.9%	13.9%
Totals	14.6%	33.3%

The anatomic evidence of outlet injury follows the trend of the proceeding studies. In analysis of the results from a chronologic standpoint, we found that as we learned to sweep deeper into the tissues on the crown suture the incidence of outlet failures decreased tremendously in the episiotomy and major laceration series. The large percentage of failures in the no episiotomy series were the groups listed as *No* and *first-degree* lacerations.

We have considered the gradation of lacerations made immediately after delivery in the group in which no episiotomy was done. In order to determine the actual amount of damage incurred at that time, we have subdivided the late results in the group without episiotomy into subgroups under the degree of laceration recorded at the examination immediately postpartum.

TABLE XI

None (27) cases		First degree (17 cases)	
A	70.4%	A	41.2%
B	25.9%	B	35.3%
C	3.7%	C	23.5%
Second degree (20 cases)			
A	45%		
B	45%		
C	10%		

Other subgroups were too small to be of value.

In scanning these statistics we agree with R. P. Kelly that, "There are some cases who deliver without episiotomy and without laceration, but when they come in six to eight weeks later they do not have the same perineum." This series emphasizes the importance of submucous lacerations and the difficulty of recognizing and correcting them at the time

of delivery. The subgroups are small and can be accepted only as indicating trends. However, it appears that where nature has provided an adequate episiotomy, i.e., a second-degree laceration, the results are better than when she provides an inadequate one.

The study of the effect of age on results brings out another interesting point.

TABLE XII. EFFECT OF AGE ON RESULTS

Up to 20	WITH	WITHOUT	25 to 30	WITH	WITHOUT
	A	71.4%		A	85.7%
	B	28.6%		B	14.3%
	C	0.0%		C	0.0%
		4.0%			22.2%
20 to 25	WITH	WITHOUT			
	A	75.8%			57.1%
	B	22.7%			28.6%
	C	1.5%			14.3%

In general all the groups with episiotomy show the same proportions. In each instance the comparison of later results is in favor of the episiotomy group. With each advance in age the group delivered without episiotomy shows a marked increase in the unsatisfactory results. We interpret this as evidence that the indication for episiotomy becomes stronger as a primipara passes the age of twenty, and that the indication is more mandatory with each successive year.

Inasmuch as 9.4 per cent of primiparas can be delivered without laceration and without demonstrable anatomic injury at follow-up, and inasmuch as an additional 19.8 per cent, though lacerated, show a Grade A result, we are not ready to join Gusman and Tritsch in their campaign for prophylactic episiotomy. We are ready, however, to paraphrase the old surgical dictum and say, "When in doubt, cut." Little has repeatedly called attention to the necessity for episiotomy in those patients with contracted bony outlets or narrow subpubic angles. DeLee has advocated it in preparation for rapid forceps deliveries, Pomeroy, as a precursor to version and the complex forceps rotations. We wish again to emphasize that this study is based on patients delivered under optimum hospital conditions. We do not advocate elective episiotomy except as a hospital procedure.

SUMMARY

Two hundred and two primiparas delivered at term by forceps are studied comparing the immediate and late results with and without episiotomy.

An analysis of morbidity suggests that there is a definite increase in morbidity attendant on episiotomy and that that increase is only partially dependent on the increased complexity of operative procedures, the percentage of intercurrent infection, and the longer duration of labor in the episiotomy series.

The types of episiotomy are considered, and it is suggested that the mediolateral type is the safer in the prevention of third-degree lacerations.

It is shown that, in our hands, much better anatomic results are obtained following episiotomy and repair. It is suggested that the better results are attributable to the easier recognition of the extent of injury done in episiotomy and the simplification of the repair where a surgical laceration is produced. It is shown that episiotomy spares the anterior wall. It is suggested that where the spontaneous laceration approaches adequate episiotomy the percentage of unsatisfactory results is less. The fallacies of examination in attempting to determine the exact amount of damage done immediately after delivery without episiotomy is shown. It is further suggested that the indication for episiotomy becomes mandatory in proportion as the age of the primipara exceeds twenty years. Many of the series are inconclusive because of the smallness of the sub-groups. They are presented not as adequate studies but as indices of the trends and the need for additional investigation.

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CURRENT TECHNICS FOR OBSTETRIC ANALGESIA AND ANESTHESIA*

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THIS is an analysis of twenty-four answers to an inquiry sent out by Dr. B. C. Hirst regarding the technic for obstetric analgesia and anesthesia used in a number of clinics, distributed as follows: California 2, Canada 1, Connecticut 1, Illinois 2, Louisiana 1, Massachusetts 1, Michigan 1, Minnesota 2, Missouri 3, New Jersey 1, New York 6, Pennsylvania 1, and Wisconsin 2. In three of the clinics reporting the department of anesthesia of the hospitals cooperates in the administration of obstetric anesthetics. Two of the replies were from the departments of anesthesia of the respective hospitals.

ANALGESIA

Information regarding analgesia was obtained from twenty-three sources, of which twenty-one have some "routine" or "standard" procedure which they follow. Flexibility of procedure and "individualization" of the treatment are stressed in three.

The time of administration varies little. In one clinic, medication is withheld until the cervix is 7 to 8 cm. dilated, but the analgesia is usually begun in primiparas as soon as the pains have become strong and regular, lasting one-half to three-quarters minutes, with five- to three-minute intervals, and the cervix dilated 3 to 5 cm. In multiparas the time of administration is determined by the character and frequency of the pains rather than by the condition of the cervix. The methods most commonly employed involve the use of barbiturates, morphine and scopolamine, and rectal ether, alone or in combination.

Barbiturates are used in sixteen clinics, and in three distinct ways:

1. As adjuvants to other types of hypnotics in 3 clinics
Sodium amyta, 2
Pentobarbital sodium, 2
2. As principal hypnotic in 12 clinics
Sodium amyta alone, 3 (in multiparas only, 1)
Sodium amyta with scopolamine, 1
"Barbiturates" (unspecified) with scopolamine, 1
Phenobarbital, 1
Pentobarbital sodium, 8
Pentobarbital sodium with scopolamine, 6

*Read at a meeting of the Obstetrical Society of Philadelphia, March 7, 1935.

Pentobarbital sodium with morphine, 1

Numgl, 1

Pernocton, 1

3. To prolong the action of morphine and scopolamine in 1 clinic
Dial, 1

The apparent discrepancy in the above figures is explained by the fact that in several clinics more than one preparation is employed. Since in some of the papers "pentobarbital" is apparently used as a synonym for the sodium salt, while in others allusion is made simply to "the pentobarbitals," these have been grouped together under the appropriate headings with pentobarbital sodium in the tabulation.

Sodium amyta or pentobarbital sodium is used early in the first stage in nervous patients who later receive morphine and scopolamine after sufficient progress has been made. In one clinic pentobarbital sodium is used "in connection with the morphine and scopolamine," but no details are given.

The most frequently used of the barbiturates is pentobarbital sodium with or without scopolamine. The technic of Irving and his coworkers at Boston Lying-In Hospital as published in *Surgery, Gynecology and Obstetrics* for January, 1934, is used in three clinics and modifications of his procedure in four more. The modifications consist in variation of the initial dose of the barbiturate or of interval and dose of scopolamine. One clinic substitutes sodium amyta for the pentobarbital. Most clinics use rectal ether to control the restlessness induced by the barbiturate. In one clinic repeated small doses (1.5 to 3 gr.; 0.09 to 0.18 gm.) of pentobarbital sodium are used; a maximum of 6 gr. (0.36 gm.) usually is sufficient to carry the patient over to the second stage. In this clinic morphine is used in rare cases of primiparous labor "early in the first stage" before the pentobarbital sodium is given, and rectal ether is used afterward in primiparous labors, or those prolonged by errors of rotation.

In one clinic where a pentobarbital-scopolamine technic is sometimes followed, sodium amyta is occasionally substituted for the pentobarbital in the same dosage.

In general, a large initial dose of pentobarbital sodium, with or shortly followed by an injection of scopolamine which is repeated as necessary, seems to be preferred to frequently repeated small doses of the barbiturate. The usual dose is 4 to 6 gr. (0.24 to 0.36 gm.) but as much as 7.5 gr. (0.5 gm.) is given at the first dose. Excitement is less and recovery more prompt, requiring less nursing supervision. One clinic remarks that the drug can be used late in labor with greater safety than morphine.

Sodium amyta is not widely used. In one clinic it is used in multiparas in place of the morphine and scopolamine which is routine in primiparas. The usual dose is 5 gr. (0.3 gm.).

Four clinics simply listed the drugs used without giving dose or method of use.

In one clinic a 10 per cent solution of allylisopropyl barbituric acid, marketed under the name of Numal, is being used intravenously, in doses of 100 mg. per kilogram of body weight, injected at the rate of 1 c.c. per minute. In their hands it has given 90 per cent satisfactory results in a series of 231 cases without harmful effect to mother or child. The users are enthusiastic, but this is not reported from any other clinic under consideration. The product is used in France with reported success.

Pernocton is given intravenously in one clinic when morphine or gas has interfered with the uterine contractions in a patient who has had a prolonged first stage and is exhausted. The contractions are said to improve and a labor which had come to a definite standstill is said to advance rapidly.

The use of dial (diallyl barbituric acid) to prolong the effect of morphine and scopolamine is mentioned by one clinic, but their series is not complete, and they do not wish to make a definite statement at this time.

There are two types of combined analgesia involving barbiturates. One clinic uses morphine sulphate gr. $\frac{1}{6}$ (0.01 gm.), scopolamine gr. $\frac{1}{150}$ (0.0004 gm.), and sodium amyta gr. 6 (0.36 gm.) by mouth, followed after four to six hours with scopolamine gr. $\frac{1}{200}$ (0.0003 gm.) subcutaneously, repeated once two or three hours later if necessary. The same technic is used in multiparas, using $\frac{1}{8}$ gr. (0.0075 gm.) of morphine.

In another clinic the morphine, gr. $\frac{1}{6}$ (0.01 gm.) is given by mouth with 3 gr. (0.18 gm.) of pentobarbital sodium, which is repeated without the morphine at four-hour intervals for two more doses.

Most clinics do not combine morphine with the barbiturates, and one specifically mentions the increased danger of respiratory depression, and also feels the use of barbiturates is contraindicated in cardiac patients because restlessness increases the strain on the heart.

One reports an increased incidence of fetal asphyxia with barbiturates, type and technic unspecified, which led to their being discontinued, but two definitely state that there was no fetal asphyxia observed. One other clinic has discarded barbiturates as "unsatisfactory"; another would have continued their use if adequate nursing facilities had been available.

Morphine and scopolamine are used in eight of the reporting clinics. The dose of morphine varies from $\frac{1}{4}$ to $\frac{1}{8}$ gr. (0.015 to 0.0075 gm.) and that of scopolamine from $\frac{1}{100}$ to $\frac{1}{200}$ gr. (0.0006 to 0.0003 gm.) for the initial dose. The scopolamine is usually repeated in smaller doses, and in one instance as little as $\frac{1}{400}$ gr. (0.00015 gm.) is used. Two of

them report the use of morphine in smaller doses in slowly progressing multiparas, while in one, sodium amyral was substituted as has been mentioned. In three clinics the morphine is repeated if the labor is prolonged, but the usual practice is to repeat the scopolamine alone, and in one clinic the morphine is never repeated after the initial dose. Two clinics specify that they do not use morphine within four hours of the expected delivery, while one does not use it within six hours. The intervals for the repetition of scopolamine vary widely. The first dose of scopolamine is given from forty-five minutes to one and one-half hours after the initial dose of scopolamine with morphine. The interval seems to bear no relation to the size of the initial dose either of morphine or scopolamine. Scopolamine is repeated once, twice, or as necessary, although in one clinic "gas" is used after about 7 cm. dilatation of the cervix rather than repeat the scopolamine. Three clinics use heroin $\frac{1}{12}$ to $\frac{1}{25}$ gr. (0.005 to 0.0024 gm.), in one, heroin is used combined with scopolamine instead of morphine. One of these clinics states that if the heroin were not available, morphine and scopolamine would be used.

In two clinics dilaudid, $\frac{1}{32}$ gr. (0.0018 gm.) has been used combined with the scopolamine instead of morphine with satisfactory results. The incidence of fetal asphyxia is in one clinic reported to be less than with morphine.

Three clinics occasionally use pantopon gr. $\frac{1}{3}$ (0.02 gm.) with scopolamine. Results are satisfactory, but it is not routine.

Rectal ether alone is used in two clinics, in one for multiparas only. The Gwathmey technic is used in primiparas, modified by omission of the magnesium sulphate in one clinic, and of both the magnesium sulphate and quinine in another.

Avertin is still used "in selected cases" in one clinic and has been used and abandoned in two others.

Inhalation anesthesia is used during the first stage in five clinics, usually in multiparas, as follows: "gas," 1; ethylene and oxygen, 2; nitrous oxide and oxygen, 2. In one clinic nitrous oxide and oxygen is used throughout labor for private patients.

Of the 23 clinics reporting on analgesia 17 used one standard method, either barbiturates, morphine and scopolamine or a combination of both, 3 report the use of 2 methods, 2 of 3 methods, and 1 listed 5 different drugs "used in selected cases."

ANESTHESIA

Twenty-four clinics reported on anesthesia. One reports only on anesthesia used in operative obstetrics and has been reserved for separate consideration. An attempt to study the technics of the remaining re-

ports dividing the anesthesia arbitrarily into four classes, 1 late second stage, 2 actual delivery, 3 repair, and 4 operative obstetrics gave the following results for 23 cases.

	LATE SECOND STAGE		DELIVERY	
	CASES	%	CASES	%
Inhalation anesthesia	22	95.7	21	91.3
Nitrous oxide and oxygen, with or without ether	15	65.2	12	52.1
Ethylene and oxygen	3	13.0	5	21.7
Ether	3	13.0	3	13.0
Chloroform	2	8.7	4	17.4
Infiltration	0	0.0	2	8.7

The percentage of those using nitrous oxide and oxygen may actually be higher than is here shown, but three clinics report the use of "gas" and are included only in the inhalation anesthesia. It is implied by some that repair is done under the anesthetic used during the late second stage and delivery, but insufficient detail makes comparable statistics for the proposed third and fourth classes impossible. In two which use gas in the late second stage and chloroform for delivery, ether is used during repair. Several clinics use either nitrous oxide and oxygen or ethylene. In one clinic chloroform is given throughout to patients unless contraindicated. In another chloroform is used when there is fetal distress to relieve the pressure on the child, followed with large amounts of oxygen alone, and no attempt is made to deliver the child until the fetal heart regains its normal rate. Indeed, the head of the child is sometimes pushed upward to relieve any tension on the cord while the chloroform is being given. It is also used in neglected cases with tonically contracted uteri.

Only nine clinics reported operative obstetric anesthesia separately.

One uses phenobarbital or pentobarbital sodium as preoperative sedative in 1.5 to 3 gr. (0.09 to 0.18 gm.) doses.

Three use local infiltration anesthesia, two for low forceps or repair only, one for laparotrachelotomy. In one of these, pudendal block is also used. The agents are not stated by one clinic, in the others novocaine or nupercaine are used, strength not given.

One uses spinal anesthesia in operative deliveries where there is no contraindication. It is not recommended for the termination of normal labor. Technic is not given.

Two prefer ether for cardiae and ether is often used in versions and extractions, manual rotations, and where relaxation is insufficient with the use of gas alone. Ethylene and cyclopropane are sometimes used with nitrous oxide and oxygen anesthesia to obtain better relaxation.

Divinyl ether and cyclopropane are still in the experimental stage. The present cost is prohibitive, but results are said to be good.

In one clinic an elaborate technic for cesarean section starts with nitrous oxide and oxygen, adding ether two or three minutes before the

incision is made. As soon as the babe's mouth is freed, the anesthetic is stopped and carbon dioxide and oxygen is given until the cord is clamped. Then a hypodermic of morphine and atropine or of pantopon and atropine is given the mother, the oxygen in the nitrous oxide and oxygen mixture is reduced, and the operation terminated under this anesthetic, usually without ether.

It is possible that these data do not represent the whole trend of obstetric anesthesia and analgesia in this country, but they have been collected from widely divergent locations and from outstanding clinics and teaching centers. No attempt has been made to extend the scope of this paper by including a survey of recent literature. It is, however, interesting to note that in none of these centers is paraldehyde used. F. Neon Reynolds in his book, *Relief of Pain in Childbirth*, published in London in 1934, dismisses the barbiturates as dangerous, but advocates paraldehyde in oil per rectum, with or without a single injection of morphine and scopolamine, for "ease of administration, general applicability, effectiveness, and ready combination with other methods" (notably nitrous oxide and oxygen or chloroform) "during the expulsion stage." Rosenfield and Davidoff of Boston published in 1932 a series of 50 cases in which they used paraldehyde with sodium pentobarbital with no failures. In *Surgery, Gynecology and Obstetrics* for February, 1935, they present a series of 300 cases with 1/335 failures, and in these the distress incident to the labor was greatly decreased, but the desired amnesia was not obtained. There was no maternal mortality in either series, and no fetal mortality which could be attributed to the use of the drugs. Excitement occurred in 7.33 per cent of cases.

Colvin and Bartholomew of Atlanta, Georgia, report in the *Journal of the American Medical Association* for February 2, 1935, a series of 100 cases in which sodium amyta was used with rectal paraldehyde, with no increase in length of labor or of incidence of postpartum hemorrhage, no fetal asphyxia, and so little excitement or restlessness in the patients that the authors do not hesitate to suggest its use in the home, in spite of the fact that it is generally accepted that obstetric analgesia should be undertaken only in hospitals where adequate nursing facilities are available.

CONCLUSIONS

Statistical analyses of small groups are necessarily misleading, but we believe the following general conclusions are justified for the group under consideration:

1. There is a striking lack of unanimity of type and technic of obstetric analgesia and anesthesia.
2. The most widely used analgesic agents are the barbiturates, among which pentobarbital sodium appears the most frequently chosen.

3. The barbiturates are given by mouth; their intravenous use has not spread extensively in the United States.
4. Barbiturates are frequently combined with scopolamine or occasionally with morphine and scopolamine.
5. Excitement induced by the barbiturates is controlled by rectal ether.
6. In general, barbiturates are not considered to increase fetal asphyxia.
7. Barbiturates have not proved universally satisfactory and have been discontinued in some clinics.
8. Barbiturates require careful nursing care of the patient while under their influence.
9. Morphine with scopolamine is the second most common type of analgesia used.
10. It is believed to increase fetal asphyxia and is not used within four to six hours of expected delivery.
11. Avertin is not widely used.
12. The Gwathmey technic is occasionally used, and is usually modified by omission of either the magnesium sulphate, the quinine, or of both.
13. Inhalation anesthesia is rarely used during the first stage.
14. On the contrary, inhalation anesthesia is almost always used during the late second stage and during delivery.
15. Nitrous oxide and oxygen, alone or with ether, is the most widely used of the inhalation anesthetics.
16. Ether is used where relaxation is necessary, and is preferred for cardiac patients to other inhalation anesthetics.
17. The use of ethylene seems to be fairly well restricted to clinics located in the Middle West.
18. The place of spinal anesthesia in obstetrics is distinctly limited.
19. Local anesthesia is not widely used.
20. The ideal of obstetric analgesia and anesthesia has not yet been attained.

Falsia, Miguel V.: **Symphiotomy for the After-coming Head**, Bol. Soc. de obst. y ginec., 13: 699, 1934.

The author recommends symphysiotomy in cases where the aftercoming head is arrested at the inlet in version or breech extraction. He reports a case without ill effect to the mother or child. The postoperative course was good.

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EXTRAUTERINE PREGNANCY*

A CLINICAL STUDY OF 500 CASES

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THE diagnosis and treatment of extrauterine pregnancy have been the subject of much thoughtful study since they were first recognized as a clinical entity. In the past few years, an enormous amount of literature has appeared on this subject. Nevertheless, the diagnosis still presents great difficulties as is evidenced by the percentage of error, and the mortality tables convince one that the ability to diagnose such cases and the method of treating them deserve further investigation.

This group of 500 cases consists of 402 cases from Cook County Hospital and 98 cases from St. Luke's Hospital. All cases from Jan. 1, 1924, to the middle of 1934 are included, and they are consecutive except where a case history is unavailable. All of the cases were proved extrauterine pregnancies by operation, autopsy, or tissue study.)

(At the Cook County Hospital, extrauterine pregnancy is considered as pathologic obstetrics, and when such a diagnosis is made on admission, the patient is assigned to the obstetric service.) Because of the obscurity of diagnosis, such patients not infrequently go to a medical or surgical service. (About an equal number are admitted to each of the gynecologic and obstetric services.) (Almost as many are sent to the gynecologic service diagnosed as pelvic infections, as are sent to the obstetric service as extrauterine pregnancies.) (Thus, it happens that the cases here reported have been cared for by any member of the surgical staff, one of the six gynecologists, or one of the five obstetricians on the hospital service.)

(*Age.*)—The extremes of age were sixteen and forty-nine years. More than three-fourths of the patients were between the ages of twenty and thirty-five.) Extrauterine pregnancy, like many other diseased conditions, has been thought by various authors to be seasonal in occurrence. Our statistics covering a period of ten years fail to show any noteworthy variation in this respect.

(*Previous Deliveries.*)—We have not attempted to designate previous pregnancies because in this class of patients the history of previous abortions is notoriously inaccurate. (There were 27.4 per cent of these women who had delivered no full-term babies; 18.2 per cent had delivered only one; 18.4 per cent had two babies. Thus, 64 per cent of the 500 had two babies or less. Thirteen patients were operated upon previously for tubal pregnancy.)

(*Time Elapsed Between Last Pregnancy and Ectopic Pregnancy.*)—The time elapsing between the date of the last pregnancy and the development of the ectopic

*Read before the Chicago Gynecological Society, January 18, 1935.

varied from six weeks after the birth of a full-term child to nineteen years, the average time being 4.7 years. In the cases where such information is available, a long period of sterility is not the rule, more than half of the extrauterine pregnancies being recorded within three years after the birth of the last child.)

(*Bleeding.*—Menstrual disturbance is a common factor in the history of a patient who has an extrauterine pregnancy. The classic history of such a patient is rather generally accepted as that of a missed menstrual period followed at a later date by mild irregular bleeding usually characterized as spotting. In our series of cases, however, more than one-third did not miss a menstrual period, at least from a lay point of view. Nevertheless, the majority of these did show a menstrual disturbance. Thus, fifty-seven patients (11.4 per cent) had bleeding which began as a menstrual bleeding at the normal time, but continued longer than a normal period, and in sixty-four (12.8 per cent) the normal period was replaced by a diminished and intermittent flow described as spotting. In a slightly larger group the patient definitely missed a menstrual period, and began to bleed vaginally from four days to fourteen weeks after a menstrual period should have occurred. In eighty-eight cases (17.6 per cent) there was no bleeding at any time. Thirty of these developed symptoms before they had missed a menstrual period, and fifty-eight had a history of missed menstrual periods but no subsequent bleeding. One patient had not menstruated for two years, but she had a definite glandular dysfunction.)

(*Character of Bleeding.*—Eighty-eight of our patients (17.6 per cent) had no vaginal bleeding between the time of the last normal menstrual period and the time at which a diagnosis of some condition requiring operative interference was made. More than half of the total (50.6 per cent) had only spotting following normal menses and while a few (6.4 per cent) spotted only one day, the great majority spotted intermittently for various periods. In a fifth of the cases (20.6 per cent) moderate bleeding was noted, and in 8.2 per cent there was bleeding that could be characterized as profuse. Two patients had actual hemorrhage, and in these cases the external flow was apparently sufficient to account for the evident blood loss.)

(*Type of Pain.*—Pain of some type is an almost universal complaint of a patient with an extrauterine pregnancy. It was present in 96.4 per cent of our cases. Every adjective description of pain has been used by these patients. The striking feature, however, is the high percentage in which sudden, severe pain was noted. This occurred in nearly two-thirds of the entire group, and in more than half of all cases it was the first pain noted by the patient. Various characterizations of this type of pain are met with, but practically all patients were agreed upon one point, namely, that it was a sudden pain which was so severe as to force them to suspend their activities immediately. That this sudden, severe pain is not invariable is evidenced by the 34.8 per cent who never had pain of any severity. Ten patients had no pain at any time. Two of these cases were unruptured tubal pregnancies discovered while operating upon patients with fibroids. Advanced extrauterine pregnancy may be present in the absence of pain, as was shown by one ruptured interstitial pregnancy with a four months' intraabdominal fetus, and one patient with an extrauterine mass as large as a four months' pregnant uterus, neither patient having pain at any time.)

(*Localization of Pain.*—One hundred twenty-two patients (24.4 per cent) complained of pain in the right side, and 89 (17.8 per cent) in the left side. The majority (52.6 per cent), however, localized the pain in the lower abdomen, though 17 of these patients complained of generalized abdominal pain. Five patients had upper abdominal pain only. Shoulder pain was admitted by 41 of the patients, or 8.2 per cent of the group.)

Thus the localization of pain was not of great help in either the diagnosis of extrauterine pregnancy or in determining its site. In our experience, shoulder pain was helpful more as corroborative evidence than as a primary diagnostic factor.

(*Temperature*.—Forty patients (8 per cent) had a temperature below 97° F. These patients were all seriously ill and in collapse. There were 35.6 per cent who had normal temperature; 41 per cent showed only a mild elevation in temperature, that is, not over 100° F. Thus, 84.8 per cent had a temperature of 100° F. or below.)

(*Sedimentation*.—A sedimentation test was done in 19 instances. In 18 of these there were varying amounts of intraperitoneal bleeding. Seven tests were normally horizontal. Nine were single curves and 3 were diagonal. In none was there a rapid sedimentation.)

(*Admission Pulse*.—Of this group of 500, only 42 (8.4 per cent) had a pulse of 80 or below. Two hundred forty-five (49 per cent) had a pulse of 100 or above. Of these 119 were above 120.)

(*Leucocyte Count*.—A leucocyte count was recorded in 339 cases. In one-third of these it was within normal limits, and in two-thirds there was a definite increase. On the whole, this increase was mild, over one-third ranging between ten and fifteen thousand, while less than 14 per cent showed more than twenty thousand.)

(*Erythrocyte Count*.—The erythrocyte counts were all taken on admission of the patient to the hospital. The time at which these counts were made undoubtedly accounts for the fact that over 60 per cent of those patients on whom red cell counts were recorded showed a count of more than three million.)

(*Pelvic Findings*.—Several interesting facts are apparent in a study of the results of pelvic examination. Palpable masses were found in a large majority of the cases (65.2 per cent). Bleeding sufficient to cause bulging of the culdesac was noted in more than one-third (33.8 per cent). The frequency of extreme tenderness was striking. Tenderness characterized as either extreme or marked was noted in 71 per cent of our patients. This phenomenon has been subject to much dispute. Litzenberg¹ describes the pelvic mass of an ectopic as "tense, fluctuant, exquisitely tender and pulsating." He also observes that the cervix is excessively sensitive to movement when there is peritoneal irritation from blood in the culdesac. Anspach² says, "A prominent and often a striking feature of the palpation is the marked tenderness of the pregnant tube. It is not unusual for the patient to start with pain at the first touch of the examiner's finger." Schumann³ says, "It is noteworthy that the tenderness on vaginal examination is usually out of all proportion to the size and density of the mass palpated, and to the experienced gynecologist the disproportionate tenderness is highly suggestive of the presence of an ectopic gestation, as against acute salpingitis. Traction on the cervix and active manipulation of the uterus greatly aggravates the pain and tenderness." Our experience has been that tenderness is almost invariably present when there is a palpable mass and that in the majority of cases the tenderness is extreme. In those cases where a mass is not palpated, excessive tenderness is frequently the factor which enables one to make the proper diagnosis. In the estimation of this factor it is to be remembered that the great majority of these patients were seen long after the onset of symptoms. Patients seen very early might show less tenderness. Thus Curtis⁴ observes, "In the region of the affected fallopian tube is a boggy, usually non-sensitive, sausage-shaped or ill-defined mass.") However, the majority of his patients were seen early.

(*Preoperative Diagnosis*.—The preoperative diagnosis was correct in 60.4 per cent of the cases. It was, therefore, incorrect in nearly 40 per cent.) The greatest difficulty in differential diagnosis was caused by the similarity of history, symptoms, and findings in extrauterine pregnancy and chronic inflammatory processes. Thus

51 patients (10.2 per cent) were operated upon under the diagnosis of inflammatory disease and 53 patients (10.6 per cent) as either ectopic or inflammatory disease. In addition to these, 23 patients (4.6 per cent) were operated upon with the indefinite diagnosis of surgical abdomen.

(*Location of the Pregnancy.*—Tubal pregnancies were about equally divided between the two sides. The most common location was in the outer one-third of the tube, and the least common in the inner third. There were eight cornual pregnancies. One patient had a cornual pregnancy on one side, and a tubal pregnancy on the other, both of which had perforated. Seven tubal pregnancies had perforated into the broad ligament. There were fifteen secondary abdominal pregnancies, the youngest of which was three months and the oldest eight months, the average age being 4.6 months. In six patients, both tubal and intrauterine pregnancies were present. After operation three of the patients aborted and three carried the uterine pregnancy to term.)

(*Associated Pathology.*—Until fairly recently, previous pelvic infection has been considered the most important factor in the causation of extrauterine pregnancy. Many observers have also noted that evidence of previous infection was by no means universally present. In this group of 500, clinical evidence of resolving adnexal infection was definitely noted in 142 cases (28.4 per cent.) It is to be expected that in a certain percentage evidence of previous pelvic infection was present but not recorded on the record of operation. The other cases in which associated pathology occurred requires no comment, except that in several of the cases of fibromyomata the ectopic pregnancy was the incidental finding, as it was in one case of incarcerated umbilical hernia.

(*Patients in Collapse.*—Ninety-one of the 500 patients came to the hospital in collapse. They showed marked pallor and a rapid, thready, soft pulse, often imperceptible at the wrist. They had cold, moist extremities, often air hunger and usually a subnormal temperature. Frequently they were restless and often semiconscious.) It is not the purpose of this report to discuss the physiology of this condition, nor to enter into the old argument of the merits of immediate versus delayed operation. Suffice it to say that immediate blood transfusion is almost an impossibility at the Cook County Hospital, because of the necessity of depending on relatives to act as donors.

(Of these 91 patients, one-third died and two-thirds recovered.) Strangely, the same percentage of each group was operated upon at once, and the same percentage had the operation delayed. In this group of 91 patients in extremely serious condition, the mortality of those operated upon at once was 34 per cent, and of those treated for shock before operation the mortality was 33 per cent. While there may be some room for argument as to the proper time to operate upon these patients, there can be no argument about the value of immediate blood transfusion in exsanguinated patients.

(*Fainting, Nausea, and Vomiting.*—Fainting was noted in 145 patients. It was almost invariably preceded by a sudden attack of severe pain. In a large number of patients, both of these symptoms occurred in association with a desire to defecate. Nausea and vomiting was a symptom in 187 patients, or more than one-third of the group.)

(*Perforation, Abortion.*—At operation it was found that 364 patients showed perforation of the tube with resultant intraperitoneal hemorrhage. Tubal abortion was noted in seventy-eight cases.) In order to avoid misunderstanding and argument over a term which is not strictly scientific, tubal abortion in this series includes all cases which at operation showed the ovum and placental tissue projecting from the fimbriae of the tube, whether this be due to growth or extrusion of the pregnancy.

(*The Unruptured Group.*—In 34 cases there was no apparent perforation of the tubal wall and no blood in the peritoneal cavity. For the purpose of this report, these were considered unruptured tubal pregnancies.) In these cases the menstrual history and the character of bleeding was not unlike that of the other cases. The diagnosis was even less accurate because several of these were discovered in connection with other pelvic pathology which was correctly diagnosed.

(The absence of sudden severe pain was noteworthy in the unruptured cases. In the 500 patients, sudden severe pain was present in about two-thirds of the patients, but in the unruptured cases cramps were the only pain complained of by two-thirds of the patients. In 2 cases there was no pain at any time.)

(*Mortality.*—A mortality of 7.8 per cent is rather higher than that of most series recently reported, and requires comment, if not explanation. There are two factors which have some bearing on this high mortality. One is that the Cook County Hospital is an emergency hospital which receives a fairly large percentage of patients who are already beyond help. The other is that there is no means of obtaining blood for transfusion except from relatives, and relatives of the patients in this hospital are notoriously unwilling to submit to this procedure.)

(Of the 23 postoperative deaths resulting from hemorrhage and reaction to operation, only 3 patients were transfused. Three patients with secondary abdominal pregnancy died. None was transfused. Experience over a period of years has taught us that exsanguinated patients are bad risks whether operated upon or not, and it is our opinion that a large percentage could be saved if prompt blood transfusions were available for them. The other postoperative deaths explain themselves. It is of interest to know that the patient who died from thrombosis had no evidence of pelvic infection or thrombosis at autopsy. The thrombosis occurred in the jugular and left subclavian veins, the superior vena cava and the right auricle)

(Twelve patients died before operation. Ten of these were considered beyond hope of operative help, and all of them died a short time after entrance. Not one of these patients received a blood transfusion. Two patients who died before operation deserve comment. Both were in excellent condition on admission. In one a culdesac puncture was done as a diagnostic procedure, and no blood was found. Although she was afebrile on entrance, a massive pelvic infection developed after the needling and a subsequent colpotomy revealed old blood and pus. The patient died from the infection. The other patient who was not operated upon was examined in the afternoon, at which time she had a pulse of 72, was afebrile and, except for the history, had no evidence of an extrauterine pregnancy.) She was kept for further observation. At 11 o'clock the same night she had a sudden severe pain, collapsed, and died within an hour.

The average stay of all patients in the hospital after operation was 15.1 days, the extremes being nine and ninety days. The time of operation varied from twenty to ninety minutes, and the average time was forty-nine minutes.

SUMMARY

1. A series of 500 extrauterine pregnancies is presented.
2. A long period of sterility preceding the extrauterine pregnancy was not the rule in this group.
3. Pain of some type was the most common symptom. In two-thirds of the patients sudden, severe pain was noted.
4. In the majority of the unruptured cases the pain was of a cramping character.
5. Abnormal bleeding was present in a majority of the patients.

6. Approximately one-third of the patients had missed no menstrual period.
7. Severe collapse occurred in 18.2 per cent.
8. Fainting was noted in 29 per cent of the patients.
9. Over half of the patients had a temperature above normal.
10. Extreme pelvic tenderness was present in nearly three-fourths of the cases.
11. The mortality rate was 7.8 per cent.
12. Blood transfusion is the most important single factor in the treatment of cases in collapse.

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104 SOUTH MICHIGAN AVENUE
122 SOUTH MICHIGAN AVENUE

A SERIES OF 627 VAGINAL HYSTERECTOMIES PERFORMED FOR BENIGN DISEASE WITH THREE DEATHS*

N. SPROAT HEANEY, A.B., M.D., F.A.C.S., CHICAGO, ILL.

AT THE 1934 meeting of the American Gynecological Society I reported a series of 565 vaginal hysterectomies performed for the cure of benign disease with two deaths, a mortality rate of 0.35 per cent.† At this time I wish to report on an additional sixty-two cases or a total of 627 cases with three deaths or a mortality of 0.47 per cent. This includes all patients operated upon since the Staff at the Presbyterian Hospital adopted ethylene as the routine anesthetic in major surgical work. During this time no case requiring a vaginal hysterectomy was treated in any other way. As a matter of fact a great number of women were successfully operated upon by the vaginal route, on whom I formerly would have done an abdominal hysterectomy either because of the size of a tumor or from the fear of adhesions, or would have given radium because they would have been considered poor surgical risks. You will notice in the table, in spite of this being a report on benign disease, several patients with cancer. The preoperative diagnosis in these cases was nonmalignant disease and the operative findings did not influence the prognosis for immediate cure, since cancers of the

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†Am. J. Obst. and Gynec., 28: 751, 1934.

uterus were so early as to eliminate infection from our consideration and those of the ovary carried no risks to immediate recovery. When the preoperative diagnosis is cancer of the uterus either of the body or of the cervix, a more radical procedure is indicated, and in addition, such cases are always infected, so that frank uterine cancers are eliminated from this report. This study is an attempt to evaluate the risks of an operation.

Thus far I have not had to abandon the vaginal route and complete the operation abdominally. Of the 627 cases 127 were nulliparas. Earlier I failed to keep a record of the number of cases requiring morecellation. It was performed thirty times in the last 168 cases.

TABLE I. AGE INCIDENCE

14 between ages of	25 to 29
200 between ages of	30 to 39
319 between ages of	40 to 49
70 between ages of	50 to 59
19 between ages of	60 to 69
5 between ages of	70 to 76

TABLE II. INDICATIONS

Fibromyoma of the uterus	338
Uncontrolled menorrhagia	119
Prolapsus of the uterus	76
Adenomyoma of the uterus	60
Persistent leucorrhea (uterine origin)	9
Sterilizing procedure	6
Retroversion	5
Uncontrollable dysmenorrhea	3
Prolapsus of the uterus with tubal pregnancy	1
Previous interposition operation producing bladder symptoms	1
Endometriosis of uterus and ovaries	1
Ovarian cyst and carcinoma of the cervix	1
Ovarian cyst	2
Dermoid cyst	1
Stricture of cervix	2
Bilateral chocolate cysts of ovary	1
Bladder tumor	1

One patient was operated upon for ovarian cyst and carcinoma of the cervix. The cervix did not appear malignant; it was badly scarred. The patient was very stout and advanced in years, and the uterus was removed in order to facilitate the removal of the ovarian cyst. Cancer was not suspected until the microscope was used. Likewise eleven other

TABLE III. COMPLICATIONS

Hypertension, systolic blood pressure over 150	79
Secondary anemia, hemoglobin under 60	71
Nephritis or albuminuria	22
Pulmonary tuberculosis (arrested)	5
Splenomegaly	1
Diabetes	5
Mitral stenosis	2

cases, unsuspected at operation, were microscopically cancer, four carcinomas of the cervix, four microscopic carcinomas of the corpus uteri, and three carcinomas of cervical polyps. There were two fibromyomas associated with carcinomas of the ovary.

TABLE IV. ADDITIONAL OPERATIVE PROCEDURES

Posterior colpopерineorrhaphy	303
One or both tubes removed	126
One or both ovaries removed	99
Plastic on urethra for incontinence	81
Removal of Bartholinian cyst	6
Removal of adenomyoma of rectovaginal septum	7
Repair of complete perineal tear	3
Repair of rectovaginal fistula	1
Repair of fistula in ano	1
Vulvectomy	1
Hemorrhoidectomy	2

TABLE V. COMPLICATIONS

Temperatures over 100.6° F. for one or more days	227
Due to cystitis	35
Probably due to wound infection	188
Femoral thrombophlebitis	1
Parotitis	1
Sponge in vaginal vault	1
Pulmonary embolus	1

The three fatal cases were as follows:

CASE 1.—Patient, operated upon for fibromyoma and menorrhagia, died on the fifth day of peritonitis. Microscopic examination showed the uterine wall to contain myriads of microscopic abscesses. It was later revealed that the patient had had an exploratory curettage within a week of her entrance upon my service and had kept this to herself.

CASE 2.—Patient had had a previous operation on appendages. During the hysterectomy the adherent ileum was incised but immediately sutured. Patient died on the fourth day from intestinal obstruction. An operation for the relief of the obstruction was performed but too late to be beneficial.

CASE 3.—Sixty-year-old multipara. Vaginal hysterectomy, extensive vaginal plastic and urethroplastic surgery because of complete procidentia and incontinence of urine. Convalescent without noteworthy deviation from the average. Stitches removed and patient allowed a wheel chair on seventh day. Felt well and recovery seemed assured. Pulmonary embolus with threatened death on tenth day. Improvement slow, but five days later it seemed she might recover. The next day another embolus occurred and death promptly followed on sixteenth postoperative day. Autopsy showed thrombosis of right femoral vein with multiple emboli in lungs.

Postoperative Hemorrhage (5 Cases).—One patient had bleeding from a vessel near the round ligament. A laparotomy was performed the day following the hysterectomy and a tiny vessel ligated. Prompt recovery followed a blood transfusion. Four patients had sharp hemorrhages shortly after going home. One required suture and transfusion, the others required only vaginal tamponade.

Injury to the Rectum.—Adenomyoma of the rectovaginal septum is not infrequently associated with disease of the uterus requiring a hysterectomy. This complication should not deter one from operating vaginally, for this growth is more amenable to attack by the vaginal route than it is abdominally. As a matter of fact I have frequently removed an adenomyoma of the rectovaginal septum and attended to the associated involvement of the ovaries by the vaginal route without removal of the uterus. When the uterus has to be removed, the procedure is greatly facilitated. In this series seven required removal of adenomyomas of the rectovaginal septum. In one a tiny perforation of the rectum was made. Immediate suture in layers with interrupted catgut was followed by an uncomplicated convalescence.

Prolapse of Fallopian Tube.—In three cases, at some time during the convalescence, the vaginal vault opened and a tube prolapsed and became adherent in the vaginal vault. In such cases the patients usually complain of a profuse watery discharge. This accident is simply attended by making slight traction on the tube under anesthesia until it is completely delivered into the vagina, when a ligature is passed around the tubal mesentery and the tube burned off with a light nasal cautery. This generally requires no hospitalization. Previous to this series when closure of the vaginal vault was perfected with continuous suture tubal prolapse was not uncommon. These patients suffered no more inconvenience than would be occasioned by the removal of excessive granulation tissue.

In general the patient was able to eat breakfast and read the daily paper the morning after the operation. When extensive plastic work had also been done the disturbance experienced was that of the plastic work rather than that of the hysterectomy. When simple hysterectomy was done the patient was singularly devoid of complaint. None of the patients had shock. None had acute dilatation of the stomach. Except for the three fatal cases the attendants experienced only rarely anxiety regarding the condition of a patient. The average length of stay in the hospital in the 627 cases was 12.03 days.

There has never been reported a series of hysterectomies by the abdominal route with so low a mortality or morbidity rate. Vaginal hysterectomy should be more frequently performed. Every gynecologist should be able to perform safely this operation when the specific indications for it arise.

VAGINAL APLASIA AND CREATION OF AN ARTIFICIAL VAGINA*

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THE following case history is worthy of record because two unusual congenital defects coexisted, vaginal aplasia and ectopic kidney. It is of further interest because a surgical "cure" was effected by the formation of an artificial vagina and by nephrectomy.

E. R., white, unmarried female, aged twenty-four years, was admitted to the Gynecologic Service of the Mount Sinai Hospital, Sept. 6, 1934, complaining of acute abdominal pain, nausea, and vomiting. The patient had never menstruated, but had suffered attacks of lower abdominal pains for three to four days at monthly intervals since the age of twelve. These periodic seizures had gradually increased in intensity and usually forced her to bed. Three weeks prior to admission, she experienced the accustomed episode of pain, but it was unduly persistent and accompanied by chills, fever, and vesical irritation. Hospitalization was occasioned by a sudden, tearing pain in the lower abdomen. The patient's family, social, and past medical histories were otherwise irrelevant.

On admission the patient was acutely ill. Her temperature, pulse and respiratory rates were 100° F., 100 and 20, respectively; blood pressure was 112/80. The abdomen was distended, markedly rigid and tender in both lower quadrants. Because there was no vaginal opening (Fig. 1), pelvic examination was performed rectally. The latter disclosed a pelvic mass the size of a grapefruit. All the secondary sex characteristics of a normal adult female were present. Aside from a moderate leucocytosis, laboratory studies (including serology) were normal.

Since there were neither visible nor palpable evidences of hematocolpos, the presence of hematometra with aplasia of the vagina was suspected. To make certain that the vagina was completely absent, the space between the bladder and rectum was incised and digitally explored (under general anesthesia). Neither vagina nor cervix was found. After forty-eight hours of observation, a laparotomy was performed (under spinal anesthesia). It disclosed the presence of degenerated blood in the peritoneal cavity, fibrinous peritonitis, cystic ovaries, bilateral hematosalpinges, and rupture of an enlarged, saclike uterus. Because peritonitis existed, the planned hysterectomy was not performed. The abdomen was closed in one layer by three silkworm-gut sutures, and both the uterine cavity and the posterior culdesac were drained. The wound healed readily and, except for the appearance of a temporary pyuria, convalescence was uneventful.

Three weeks later, an artificial vagina was created by adapting pedicle grafts from the patient's well-developed labia minora (Fig. 1). A wide channel was burrowed between the bladder and the rectum, reaching the peritoneal reflection of the culdesac. The scar tissue of the previous incision necessitated frequent use of sharp dissection. To serve as anatomic guides during the dissection of the vaginal bed, a finger was kept in the rectum and a sound in the bladder. For hemostasis, the channel was temporarily tamponed with gauze. The flaps were prepared by amputating the labia minora from above downward to a point one-half inch above the fourchet (Fig. 2). The hemostatic packing was then removed. The dissected labia

*Read before the Obstetrical Society of Philadelphia, March 7, 1935.

were split, separating the two surfaces of each labium (Fig. 3). Two catgut sutures were drawn from the dome of the prepared space to the upper edges of the respective labial flaps. The flaps were inverted into the canal, raw surface to raw surface, and

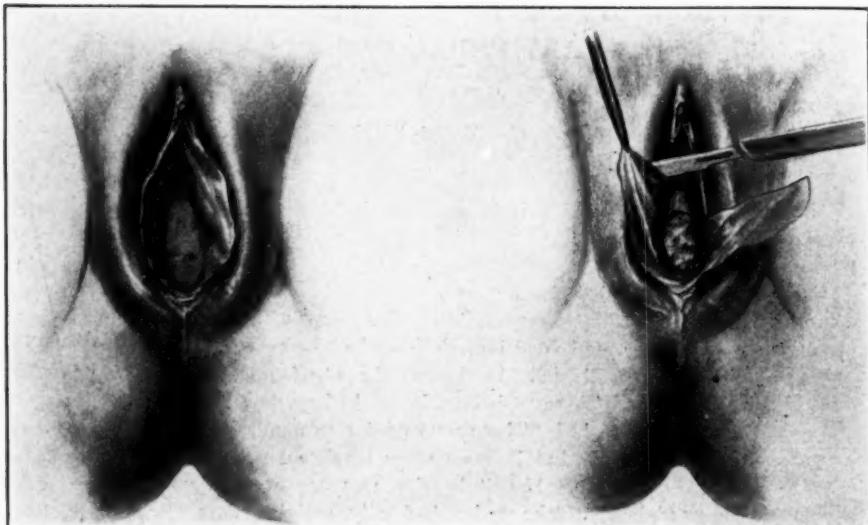


Fig. 1.

Fig. 2.

Fig. 1.—Vaginal aplasia. The labia minora are large and well suited for adaptation as flaps of a pedicle graft.

Fig. 2.—Artificial channel between bladder and rectum is packed with gauze. The labia minora dissected from above downward.

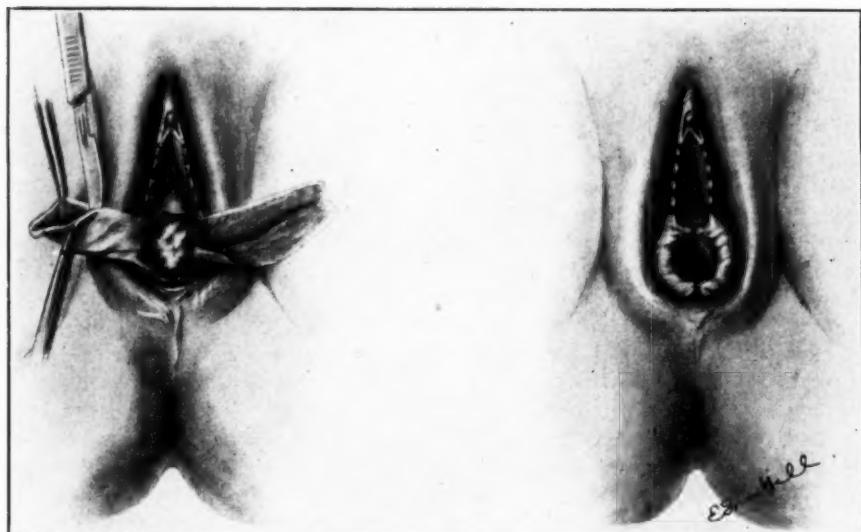


Fig. 2.

Fig. 3.

Fig. 3.—Labial flaps split and unfolded. Wound edges above sutured.

Fig. 4.—Labial flaps inverted into prepared canal and sutured to each other. New vagina lined by skin of labia minora.

the sutures tied. The grafts were united in situ to form a tube by several additional sutures (Fig. 4). Thus, the walls of the canal were the cutaneous surfaces of the

dissected labia minora. The new vagina was packed with vaseline gauze and an indwelling bladder catheter was inserted. Both packing and catheter were removed in forty-eight hours. Beginning on the eighth postoperative day, digital dilatation of the artificial vagina was instituted and performed daily for six weeks to combat excessive contraction of the grafted flaps. The vagina, five months after its formation, easily admits two fingers to a depth of $2\frac{1}{2}$ inches.

The pyuria reappeared and was traced to the left kidney by cystoscopic examination. An excretory urogram disclosed a normal right kidney and ureter; the left kidney failed to excrete dye, necessitating a retrograde pyelography which showed the existence of a pyonephrotic, ectopic left kidney lying at the pelvic brim (Fig. 5). Partial drainage of the infected kidney was effected through a No. 12 indwelling ureteral catheter which remained *in situ* for many days periodically. No improve-



Fig. 5.—Pyelogram (retrograde) revealing left ectopic kidney. Note the markedly dilated calices.

ment, either local or constitutional, was noted. The patient was then subjected to intensive irradiation of the pelvis in the desperate hope of destroying what little function still existed in the pyonephrotic kidney and thus controlling the infection. Another objective of pelvic irradiation was castration, in order to prevent reaccumulation of menstrual blood for which there was no outlet. A total of 800 roentgen units (a full erythema dose) was administered to the pelvis in divided doses. The irradiation had no discernible effects on either the pyonephrosis or the septic state of the patient. She was prepared by several transfusions of whole blood and, one month after the last roentgen treatment, nephrectomy was performed. The pelvic organs were exposed for examination through a left rectus incision. The uterus and adnexae were mere fibrous cords, probably a result of the intensive irradiation. After closing the peritoneum, the ectopic kidney was reached extraperitoneally

and removed without undue blood loss. Convalescence from this third operation was uneventful. When discharged on Jan. 29, 1935, a month after the last operation, the patient was free from pyuria and in good physical condition.

COMMENT

The exact frequency of vaginal aplasia is not known. It is always congenital and often symptomless, being associated with uterine aplasia. Its symptoms (primary amenorrhea, pelvic tumor, and abdominal pain) arise in the presence of a normal uterus. If the retained menstrual blood reaches the peritoneal cavity, peritonitis may occur.¹ The treatment of vaginal aplasia, in the presence of a functioning uterus, requires an abdominal hysterectomy and subsequent formation of an artificial vagina. Occasionally, the uterine cavity may be joined to an artificially formed vagina.²

Collective reviews of operations designed to create an artificial vagina have been presented by Kroemer³ and Pemberton.⁴ All such plastic operations require a channel to be burrowed in the areolar tissue between bladder and rectum. They differ only in the technic by which the artificial channel is converted into a permanent vagina. To this end, continuous dilatation alone and free grafts of various tissues (autogenous and heterogeneous) have been employed with varied success. The most widely accepted operation, despite the high primary mortality, has been the intestinal (ileum or rectum) transplantation type (Baldwin⁵ and Schubert⁶). Less dangerous are the procedures which fashion an artificial vagina by adapting pedicle grafts from the thighs and labia.⁷ The use of pedicle grafts from the labia minora require well-developed external genitalia. When such is the case, the labial operation recommends itself because of its relative simplicity.

The association of genital and renal anomalies has a relatively high incidence. Recently, Hodgson⁸ recorded the simultaneous occurrence of ectopic kidney and vaginal aplasia. Ectopic kidney is also a congenital anomaly. It usually lies obliquely across the left sacroiliac synchondrosis, and is characterized by an anterior (nonrotated) renal pelvis, an abnormal blood supply, and a short ureter. Thus, nephrectomy of such an organ, though often indicated, is fraught with technical hazards.

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CANCER OF CERVIX AND VAGINA IN A CASE OF COMPLETE PROCIDENTIA

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MOST gynecologists believe that malignancy rarely develops in the prolapsed uterus, but Emmert and Taussig¹³ in a recent article conclude that it does so not infrequently. These two observers report a series of ten cases of complete prolapse, in four of which malignancy had developed, and they write: "From this one may infer that if biopsies were made of all the decubitus ulcers of prolapsed uteri more cases of cancer would probably be discovered."

A study of the literature on cancer of the cervix and on complete prolapse should be of help in determining whether or not these two conditions are often or only rarely encountered together. As far back as 1882, Fritsch,¹ in Billroth and Pithra's *Handbook of General and Special Surgery*, wrote that it is remarkable that the prolapsed uterus seems to be almost immune against cancer. J. Williams,² in the Harveian lecture for 1886, reported a single case of malignancy occurring in a seventy-seven-year-old woman with a prolapsed uterus. In 1893, Pomtow³ was able to collect only twenty-nine such cases in the whole medical literature. Kurtz⁴ in the following year added to the literature the report of one more patient suffering from these two conditions. Of special interest is the article by Bäcker,⁵ published in 1897. This author found just one instance of malignancy of the cervix in a prolapsed uterus in an investigation carried out at Budapest on 11,000 women, 755 of whom had uterine carcinoma.

Schmidt,⁶ in 1898, added three additional cases to those already reported, but from then on there were no further reports of malignancy occurring in the prolapsed uterus until 1926. In that year Macleod⁷ had under his care two women with this condition, and in 1929, Kraul⁸ reported the case of a sixty-year-old woman with a prolapse as large as two fists and a carcinoma of the cervix, the size of the palm of the hand. In 1930, Höglér⁹ reported the largest number of women with both prolapse and carcinoma of the uterus that up to that time had been observed in any one clinic. He summarized the history of five such patients treated in the University Frauenklinik of Vienna and added two other cases seen in the Frauenklinik at Prague. Nevertheless, most of the articles published in later years have indicated even more strongly than the earlier ones that malignancy rarely develops in the prolapsed uterus.

Moreover, when Delvaux,¹⁰ in 1931, wrote to Hartmann, Legars, Schroeder, Sebrechts and Sellheim, they all replied that up to that time they had never seen such a case. As has already been mentioned, Emmert and Taussig suggest that if the ulcers on the prolapsed uteri were better studied more instances of cancer would be recorded. However, it is hard to believe that such eminent gynecologists as Hartmann of Paris, Schroeder of Kiel, and Sellheim of Leipzig, do not have very complete pathologic studies made on all the operative material obtained from their clinics.

Heidler,¹¹ in 1933, published in the *Zentralblatt f. Gynäkologie* summaries of the histories of three women with carcinoma in the prolapsed uterus, but the most recent articles on this subject have appeared in American medical journals. For instance, Boukalik,¹² in 1934, reported a case which was of unusual interest because his

patient was only thirty-three years of age when she developed a carcinoma in the prolapsed uterus. This author stated that Pomerey of Cleveland, in 350 cases of the cervix studied microscopically, saw only this one that had developed in a prolapsed uterus. Finally, we come to the article by Emmert and Taussig on "Cancer and Prolapse of the Uterus." This report differs from any other published on this subject. Not only is it remarkable that these authors have had the opportunity to observe such an unusually large number of cases of malignancy developing in the prolapsed uterus, but what is particularly astonishing is that they studied only ten cases of prolapsed uteri and found all their four cases of malignancy in this small series.

A rather striking example of malignancy developing in a prolapsed uterus recently came under my care and arousing my interest in this subject led me to investigate the records of the Johns Hopkins Hospital. In 1900, Dr. T. S. Cullen¹⁴ published his book, *Cancer of the Uterus*, based on the study of 147 cases of carcinoma of the cervix, studied between the years of 1893 and 1899 in the laboratory of Gynecological Pathology in the Johns Hopkins Hospital. In this group of 147 cases of cervical malignancy there was not a single case in which the carcinoma had developed in a prolapsed uterus. Cullen, himself, in 1920, operated at the Church Home and Infirmary on a seventy-five-year-old woman with a complete prolapse. The biopsy taken from her cervix showed squamous-cell carcinoma. She lived ten years and died from a condition in no way associated with the cervical cancer. This is the only case that Cullen has seen of malignancy in a prolapsed uterus. In 1923, Martzloff¹⁵ published a series of articles, based on the study of 387 cases of carcinoma of the uterus that had been admitted to the Johns Hopkins Hospital. This author does not record a single instance of a carcinoma occurring in a prolapsed uterus.

The type of operation performed for prolapsus uteri varies in different clinics. At the Johns Hopkins Hospital the "Watkins interposition" is the procedure of choice. Usually but not always a part of the cervix is removed in this operation. The amputation carried out in such cases is not a high one but usually consists of the removal of only the hypertrophied and elongated portion of the cervix. Such an operation would certainly be unsatisfactory when used as method of treatment for carcinoma of the cervix. In spite of all this, a follow-up study, which I¹⁶ made on fifty-six patients on whom the interposition operation was performed, did not show a single patient who in later years died from carcinoma of the uterus. These statistics from the Johns Hopkins Hospital seem to confirm the opinion of those who believe that malignancy seldom develops in a prolapsed uterus.

A brief report of a case which was recently under my care follows:

M. S., aged sixty-five, came to the Diagnostic Clinic of the Johns Hopkins Hospital on October 10, 1934, complaining that "her womb came down." She stated that the condition had been present for fifteen years, although she had never let anybody know about it until a few weeks before she entered the hospital. There had been a leucorrheal discharge for many years and in the last six months this had become bloody. The patient had had fourteen pregnancies. The menopause had occurred twenty years previously. The rest of the patient's history had no bearing on her gynecologic condition. The general physical examination was essentially normal for a woman of her age. The heart and lungs showed no pathologic changes. Blood pressure 142/80. The urine was negative on both chemical and microscopic examinations.

The gynecologic examination showed a prolapse of the uterus, which measured from the external urethra to the tip of the prolapse 15 cm. and which had a circumference of 30 cm. The external os of the cervix had been replaced by a hard

indurated ulcer, measuring 4×3 cm. and on the left lateral vaginal wall there was a second ulcerated lesion, measuring 6×5 cm. The latter did not connect directly with the other. Fig. 1 shows the appearance of these two ulcerated lesions and their relation to each other. Biopsies taken from the two lesions showed, microscopically, definite squamous-cell carcinoma. Because of the marked prolapse an operation was advised instead of radiation.

Dr. Elmer G. Hall, the patient's physician, referred her to me after she had been studied in the Diagnostic Clinic and asked me to operate on her at St. Joseph's Hospital. A vaginal panhysterectomy was performed with an extensive resection of the vaginal walls, so as to remove the carcinoma with as wide a margin as possible. Four-fifths of the entire vagina was removed with the uterus. In carrying out this



Fig. 1.—Cancer of cervix and vagina in a case of complete procidentia.

operation some difficulty was experienced in locating and avoiding the ureters. Fortunately, the patient's postoperative course proved that these structures had not been injured. The stumps of the uterine ligaments were united in the manner usually employed in an ordinary vaginal panhysterectomy. The patient was extremely ill for one week after the operation, but she was discharged from the hospital on the twenty-fifth day. At the present time, four months after the operation, she is up and carrying on her usual household duties. She has no complaints, and pelvic examination shows no evidence of malignancy or of prolapse of the vagina. So large a portion of the vaginal walls had been removed at operation that the vagina now has a depth of only 2 cm. The rectal examination shows no induration in the perirectal tissue.

SUMMARY

A case is reported of carcinoma developing in the vagina and cervix of a patient with a complete uterine prolapse. Studies made of the material in the Gynecological Pathological Laboratory show that this is the only case of its kind that has been seen in the Johns Hopkins Hospital.

Why the cervix of the prolapsed uterus should possess so large a degree of immunity to malignant degeneration has never been satisfactorily explained. One would naturally suppose that the converse would be true, for the cervix of the prolapsed uterus is constantly exposed to irritation and often is the seat of a chronic infection—factors that have been shown usually to predispose to the development of cancer. It has been suggested that the cornification of the cervical epithelium which develops in a case of complete procidentia protects the cervix against malignant degeneration. This may be a factor in protecting the prolapsed uterus, but it hardly seems sufficient to explain fully such marked resistance to the development of cancer.

Thanks are due Miss H. M. Carpenter for the accurate and expressive illustration.

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MEDICAL ARTS BUILDING

Schilling, W.: Permanent Results of the Schauta-Stoeckel Vaginal Radical Operation for Carcinoma of the Cervix, Zentralbl. f. Gynäk. 57: 114, 1933.

The author reports statistics on 150 women seen in the Frauenklinik of Leipzig with carcinoma of the cervix who were treated by combined radical vaginal operation and roentgen irradiation. All diagnoses were confirmed by histologic section. The per cent of five-year cures, according to Winter's classification of extent of the disease at the time of admission, was:

GROUP	NUMBER OF WOMEN	NUMBER WELL AFTER FIVE YEARS	PER CENT
I	90	61	67.7%
II	34	18	52.9%
III	26	8	30.7%
	150	87	58.0%

Seven women received radium; 5 pre- and 2 postoperatively. In general, the women received 95 to 110 per cent of an erythema dose of roentgen rays through each of 6 ports, postoperatively.

The primary operative mortality was 6, or 4.0 per cent.

WILLIAM F. MENGERT.

PREGNANCY IN A PATIENT WITH COMPLETE DOUBLE UTERUS

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GROSS anomalies of the genital tract are so rarely met that they prove perplexing to the obstetrician when pregnancy occurs. The present report describes the case of a young woman with a complete double uterus who has just passed through her first pregnancy with delivery of a normal healthy child.

Mrs. S. H. S., aged twenty years, was first seen by the authors in a gynecological clinic in April, 1932, with chief complaint of severe dysmenorrhea.

Menses began at eleven years; the patient had had marked dysmenorrhea starting three days before each period and lasting until three days after the period was over. In 1929, when fifteen years old, she had several attacks of acute abdominal pain, usually starting on one side and crossing to the opposite side. There was no vomiting; the attacks lasted for about twenty-four hours and disappeared. There was, however, during this time an almost constant dull pain in the right side, which frequently became sharp when rising from a sitting position. After an acute attack in July of this year, the patient was sent to the hospital and an appendectomy and right oophorectomy were performed.

The pathologic laboratory report states that the appendix was enlarged, with obliterated lumen, densely fibrotic walls, atrophied muscle and obliterated glands. The right ovary consisted mainly of a large luteal cyst filled with hyaloid material; the cyst walls and cortex were thin and sclerotic.

A diagnosis of obliterative appendicitis and luteal cystic ovary was made and the patient was discharged on the seventeenth day in good general condition. The family was informed at this time that the girl's genital organs were abnormal.

In 1932, the patient came to the gynecological clinic for treatment of the dysmenorrhea which for the past three or four months had become increasingly severe and necessitated remaining in bed for several days of each month. The pain started just above the symphysis and radiated chiefly to the left side, left loin, and down the left leg.

On physical examination the patient appeared to be a perfectly normal seventeen-year-old white female, but pelvic examination revealed a double introitus and double vagina, each side with a small buttonlike cervix. The uterus could not be easily palpated because of abdominal rigidity. The adnexa were not palpable.

Dilatation of both cervices was advised as a palliative measure, and this was done May 3, 1932. At operation, a Rubin test showed the left tube patent at a pressure of 80 millimeters of mercury. The right tube was not patent. At attempt at lipiodol injection and x-ray was unsuccessful. The vaginal septum was removed at the request of the mother.

After the operation there was partial relief from dysmenorrhea for several months, then the patient married and moved to another state. In a short time it was reported that the dysmenorrhea was becoming progressively more severe. On one occasion the patient became comatose just before onset of menses. At this point cervical dilatation was again resorted to and several of the subsequent periods were accompanied by greatly diminished dysmenorrhea.

The patient had a normal menses on March 9, 1934, missed the next period, and soon experienced moderate nausea and frequency of urination. About ten days after the April period was due, there were slight cramps and spotting for two days, and at the time for each later period she had cramps and bleeding with clots of varying size. The duration and amount of flow were always less than normal.

Early in September the patient returned to Philadelphia and examination revealed both cervixes to be soft and closed but instead of being side by side as before, one was found to be directly anterior to the other. The uterus was globular, turned to the left, and extended to the level of the umbilicus. Fetal movements could be felt. On palpation no irregularity of the uterus or mass in the right adnexa could be discovered. One week later when a period would normally have been expected, the patient experienced severe crampy pains and expelled two pieces of tissue or blood clot the size of a hen's egg. These were lost, but definite shreds of endometrial tissue were expelled with bleeding for the next two days. No untoward effects on the pregnancy could be noted.

The clinical history led to the conclusion that the patient had a complete double uterus, that the pregnancy was in the left side, and that the menstrual bleeding was coming from the right. This symptom-complex was repeated four weeks and again eight weeks later with uterine contractions of sufficient severity to require bed rest for several days and repeated doses of morphia to prevent premature birth of the child.

At consultation it was decided that premature labor was almost sure to occur in view of the preceding history, that cervical dystocia with a long hard labor could be expected, and that rupture of the uterus must be guarded against. An elective cesarean section, as soon as the fetus was unquestionably viable, was believed to be the procedure of choice from the standpoint of both mother and child.

The patient was admitted to the Greatheart Service of Temple University Hospital at the end of the thirty-sixth week of pregnancy. She had been having irregular mild labor pains for two to three hours a day for the past week. Twenty-four hours after admission a midclassical cesarean section was done and a living female child was delivered, weighing 4 pounds 15½ ounces.

As soon as the uterus was closed and had contracted, it was thoroughly examined and found to have but one round ligament and one tube and ovary. A mass, the size of a goose egg, firm and regular, was palpated in the pelvis. When this was brought into view it proved to be the right uterus minus round ligament, tube and ovary. The right broad ligament with numerous adhesions was present. There were no bands or adhesions joining the two uteri.

The patient had poor vaginal drainage and a temperature ranging from 100° to 101° for seventy-two hours postoperative, followed by an uncomplicated convalescence. She was discharged from the hospital on the eleventh postoperative day with the abdominal wound completely healed, but with a moderate degree of subinvolution of the uterus.

The baby was kept in the hospital until four weeks old because of early weight loss and inability to maintain body temperature when not in an incubator. At two months she weighed 7 pounds 10 ounces and appeared to be thriving normally.

Examination of the mother eight weeks postpartum showed both cervixes small, firm, closed, and situated side by side. The left uterus was completely involuted, was in midposition, and the fundus bore over to the left. The right uterus could be barely palpated in deep midposition pointing to the right.

Pregnancy in double uterus is not unusual, but the carrying of such a pregnancy to a successful termination is rare.

An interesting factor in the present case is the establishment of menstrual periods, which were apparently normal for this particular individual, in the nonpregnant uterus as soon as the inhibiting effect of the newly formed corpus luteum became lessened.

Fortunately for the patient, the removal of the right tube and ovary makes it impossible for pregnancy to occur except in the left side. Otherwise she might have become pregnant in either uterus or become pregnant in one uterus when a pregnancy had already been established in the other, thus giving rise to all manner of complications.

The authors wish to acknowledge with thanks the courtesies and aid of Professor J. O. Arnold in the management of the case.

2021 WEST GIRARD AVENUE

BILATERAL PERIPHERAL PARALYSIS OF THE RADIAL NERVE IN A NEWBORN INFANT

L. HOWARD SMITH, M.D., PORTLAND, OREGON

(From the Department of Pediatrics of the University of Oregon Medical School)

PARALYSIS of the musculospiral nerve (*N. radialis*) occurring in the newborn is of sufficient rarity to warrant recording. When I¹ reported two cases of this unusual type of obstetric paralysis in 1916, only a few cases were mentioned in the literature. Since that time several have been reported. Kehrer² in his excellent monograph on paralysis of the arm in the newborn, collected some twenty-eight reports of peripheral radial paralysis of the newborn. Langen's³ article on radial paralysis in the newborn, in which he reports three cases of his own, is most complete.

I have been able to find only three cases of *bilateral* paralysis of the musculospiral nerve in the literature. One was reported by Koster⁴ following fracture of both humeri. Kehrer² and Ottow⁵ reported one case each where both radial nerves were paralyzed with resulting bilateral wrist drop.

REPORT OF CASE

Baby McC.—First child of an eighteen-year-old mother, whose pelvic measurements, although slightly less than the average normal, are still within the normal limits: Interspinous, 25.0 cm.; intercrestal, 27.5 cm.; ext. oblique, left 21.0 cm., right 22.5 cm.; baudeloque, 20.0 cm.; transverse diameter, 8.5 cm.; anterior-posterior diameter, 10.5 cm.

Delivery was spontaneous after a long, hard labor (nearly 70 hours). Vertex presentation, L. O. A. Amniotic fluid thick with meconium. Asphyxia with moderate cyanosis. Resuscitation with some difficulty. No further attacks of asphyxia but color not very good for two or three days. Birth weight was 3,300 grams.

Four days after birth the infant had slight twitching of the arms and it was then first noted that he had a bilateral wrist drop. When disturbed, both wrists were sharply flexed with the thumbs abducted across the palms and the fingers partially flexed, suggestive of carpal spasm of tetany (Fig. 1). There was no pedal spasm, but because of a suggestive Chvostek reaction and blood serum calcium of 8.8 mg. and phosphorus of 5.9 mg. per 100 c.c. of serum, the infant was given an intramuscular injection of 10 c.c. of calcium gluconate (10 per cent solution).

For the next week he received calcium gluconate, 1 gm. with his feedings three times daily. Seven days after birth the blood showed calcium 9.4 mg. per 100 c.c. of serum and phosphorus 6.4 mg.

At this time the baby showed no twitching of the arms, color good, and nursing normally, but there was bilateral wrist drop. The deltoid biceps and triceps were used normally, and when the wrists and fingers were extended, the infant voluntarily contracted the flexors of the wrist and fingers, but no movement of the extensors



Fig. 1.—Showing bilateral wrist drop due to paralysis of both right and left radial nerves.

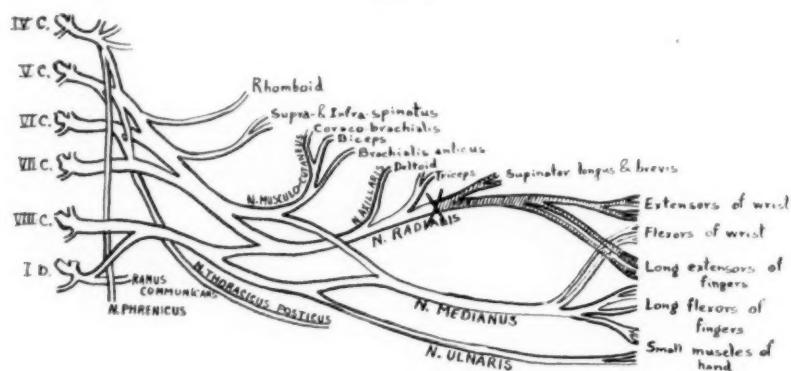


Fig. 2.—Diagram of brachial plexus. X. The probable site of injury to the N. radialis, distal to the muscular branches to the triceps but proximal to the branches given to the extensors of the wrist.

of the wrist could be elicited. Both forearms were placed in splints to prevent stretching of the extensor muscles. At the age of two weeks there was slight movement of extension of the fingers but not of the wrist. The blood calcium taken at this time showed 11.2 mg. and the phosphorus 6.2 mg. per 100 c.c. of serum.

When one month old wrists were extended voluntarily but muscular power was weak.

At no time was there any mark noted on the skin of the arm as the result of pressure, and x-ray examination of the bones of the arms was negative for fracture.

COMMENT

Although there was some suggestive evidence of tetany of the newborn in this case, I do not believe it sufficient to warrant such a diagnosis.

The presence of Chvostek's facialis phenomenon in the newborn, as pointed out by Stevenson, Mitchell and Koch,⁶ cannot be regarded as a pathognomonic symptom of tetany in the newborn. Jerking and twitching movements of the arms were present but there were no convulsions. The position of the hands simulating carpal spasm was doubtless due to contracting of the flexors of the wrists and fingers without the normal opposing extensors which were paralyzed. There was no pedal spasm. The blood calcium of 8.9 mg. per 100 c.c. of serum is below the average normal, but not as low as the expected calcium in tetany (6 to 7 mg. per 100 c.c.). However, cases presenting clinical symptoms of tetany in the newborn have been observed without marked lowering of the calcium (Shannon,⁷ and Bass and Karelitz⁸). Rothstein⁹ states that the diagnosis of tetany in the newborn will be suggested clinically by the presence of some or all of the following signs and symptoms: "Vomiting, hyperpyrexia, convulsions, twitches, tremors, carpopedal spasm, laryngospasm, positive Chvostek and Trouseau phenomena, and subcutaneous edema. Before intelligent treatment can be given, the diagnosis must be proved by the presence of a lowered blood calcium content."

Perhaps the case here reported is one of latent tetany, but regardless of the presence or absence of tetany, the infant showed definite paralysis of the wrist extensors with bilateral wrist drop.

The cause of the bilateral radial nerve paralysis with resulting wrist drop in the present case is rather obscure. Although no pressure marks were observed over the course of the radial nerve in the upper arm, the prolonged labor in a young primipara, with slightly less than the average normal pelvic measurements and the presence of an amniotic fluid thick with meconium, would indicate excessive pressure on the fetus during its passage through the birth canal. The presence of a pressure mark on the skin is not necessary in making a diagnosis of peripheral facial nerve paralysis when one observes paralysis of the facial muscles in a newborn.

The point of injury of the radial nerves in the present case (see chart) must be distal to the muscular branches to the triceps, but proximal to the branches given off to the supinator and extensor muscles of the wrists. This calculated point of injury is situated on the outer surface of the arm just above the external condyle where the radial nerve curves around the humerus.

SUMMARY

A case of bilateral peripheral radial nerve paralysis in the newborn is reported.

The injury occurred distal to the branches of the nerve to the triceps, resulting in a bilateral wrist drop.

Several features suggestive of tetany of the newborn were present but insufficient to make a diagnosis of this condition.

The early use of splints to prevent stretching of the paralyzed muscles was an important element of treatment in restoring early function and in the prevention of permanent disability.

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OVARIAN PREGNANCY*

REPORT OF A CASE

HOWARD J. HOLLOWAY, M.D., EVANSTON, ILL.

MRS. B., aged twenty-six, consulted me to see if she was in sufficiently good physical condition to have another child. She had one child, aged five, and had had two spontaneous miscarriages at approximately twelve to sixteen weeks, respectively, with a history of fever and infection, following the last one, confining her to bed for several weeks.

Menstruation at fourteen, regular twenty-eight days, five-day duration, moderate flow, pains, cramps and backache first and second day. Uterus third degree retroversion, freely movable, normal size and consistency. Nothing abnormal felt in region of either adnexa. Cervix lacerated and eroded.

Patient was advised to have a tubal insufflation, which was positive, and cauterization of the cervix.



Fig. 1.

About six months later patient returned having gone over her expected date of menstruation about nine or ten days, complaining of being tired all of the time, sore breasts, some nausea and dizziness. On pelvic examination the uterus was only slightly, if at all enlarged, still retroverted but movable. Patient was given usual prenatal instructions. Five days later she called, stating that she had started slight bleeding. She was immediately put to bed, given sedatives, but continued bleeding. Two days following, patient passed a small piece of material which grossly looked like decidua. Fluid extract of ergot was then given, with tentative diagnosis of incomplete abortion. The tissue was examined microscopically and no chorionic villi could be seen.

Patient continued bleeding slightly and was advised to go to the hospital. The diagnosis then was of incomplete abortion or extrauterine pregnancy. This was five days since onset of bleeding.

*Presented before the Chicago Gynecological Society, January 18, 1935.

At no time did patient have any pain until on entering the hospital when she started to have slight cramps in the right lower quadrant. Bimanual examination at this time revealed a swelling in region of right adnexa and about the size of a golf ball. The ovary could not be isolated separately from this mass. Dr. Heaney was asked to see the case in consultation, and the findings were verified, and a diagnosis of probable extrauterine pregnancy was made. Operation was advised. An Aschheim-Zondek test was not made. At this time patient had a temperature of 99°, red blood count 4,750,000, hemoglobin 87 per cent, white blood count 13,700, and urine negative.

This was exactly seven weeks since onset of last regular menstrual period, and six days since onset of bleeding.

The uterine cavity was examined and not enough material was obtained to explain the continued bleeding. The posterior culdesac was then opened and a small amount of dark blood was found in the peritoneal cavity. Both tubes were then examined throughout and found absolutely normal. Some fresh bleeding, however, could be seen coming from the right side, and on examining farther the right ovary was found to be bleeding and it was brought down into view in the culdesac incision. It was about the size of a large plum, half of which was a dark bluish red color and bleeding. This discolored portion with some normal ovarian tissue was resected and the remaining portion of the ovary closed with interrupted catgut. The culdesac was then closed in the usual manner.

The patient made an uneventful recovery, going home on the tenth day. Microscopic section showed normal ovarian tissue and chorionic villi.

HUMAN OVUM IN A SALPINGITIS Isthmica Nodosa*

A. F. LASH, PH.D., M.D., CHICAGO, ILL.

(From the Department of Gynecology of the Mt. Sinai Hospital and the University of Illinois, College of Medicine)

THE report of this section of a salpingitis isthmica nodosa is presented to demonstrate the often-mentioned cause of ectopic pregnancy.

This specimen was obtained from a twenty-eight-year-old nulliparous white woman. Her last period was from Sept. 15 to 18, 1934. The previous period occurred on August 19 to 23.

She was operated upon Sept. 22, 1934, because of severe persisting backaches due to a fixed retroverted uterus. At operation a typically healed (probably gonorrhreal) pelvic peritonitis with cobweb adhesions was found fixing the corpus in the posterior culdesac. After freeing the corpus and adnexa, a right salpingitis isthmica nodosa was found and a right cystic ovary. The right tube was removed; the right ovary resected; the fimbriated end of the left tube was freed of adhesions, opened and inflated; and the round ligaments were shortened. The patient made an uneventful recovery.

When she was seen on November 30, she related that her menses recurred on October 25 to 29 and on November 22 to 26. A tubal insufflation was performed and the left tube was found open.

The photomicrograph of the fallopian tube illustrates an ovum in a follicle of the isthmica nodosa which condition has been given so often as a cause of ectopic pregnancy. As to the age of the ovum one is unable to say definitely because of

*Presented before the Chicago Gynecological Society, January 18, 1935.

the shrinkage and its degenerative condition. It is assumed it came from the ovulating follicle preceding the last menses. It appears degenerative with probable polar bodies. Serial sections could not be obtained because the pathologist of the hospital, Dr. I. Davidson, who recognized the ovum in his routine examination of the tissue, immediately had more sections made from the block but was unsuccessful in finding any further evidence of parts of the ovum.

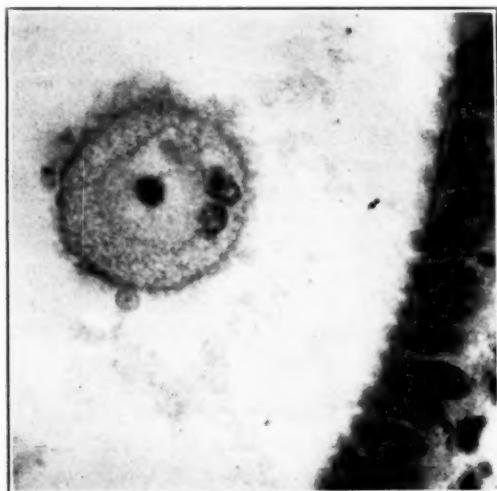


Fig. 1.—Human ovum in follicle of salpingitis isthmica nodosa. Ovum measured 31 microns.

Human tubal ova have been obtained by irrigating the tubes with normal saline and catching the washings in watch glasses for examination. Allen, Pratt, Newell and Bland studied nine such specimens, five of which proved to be ova. According to their investigations the size of the ova found in the tube shortly after ovulation varied from 90 to 180 microns. Paten and Gassmann have reported two human tubal ova.

30 NORTH MICHIGAN AVENUE

Vignes, Rodolfo E.: Carcinoma of Tube Presentation of a Case, Bol. Soc. de obst. y ginec. 13: 426, 1934.

After a discussion of the pathology and incidence of tubal carcinoma, which they find to be 0.4 per cent to 0.11 per cent of all genital carcinomas, the authors report a case. The treatment consisted in extirpation and postoperative x-ray irradiation.

MARIO A. CASTALLO.

MYOFIBROMA OF THE OVARY WITH HETEROPLASTIC BONE FORMATION*

IRVING F. STEIN, M.D., CHICAGO, ILL.

(From the Michael Reese Hospital)

THE tumor was taken from a patient sixty-six years of age, who was told some years ago that she had fibroids of the uterus, but who on account of her age declined any operative treatment. When I saw her, she stated that she sought relief

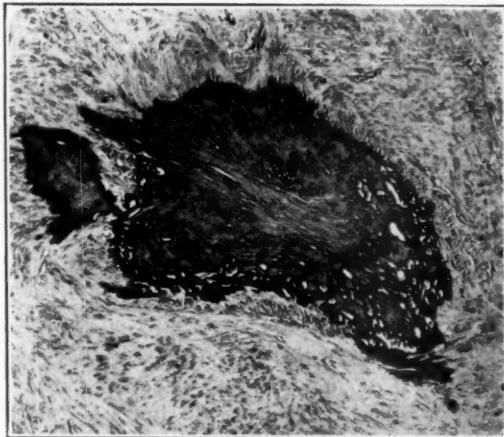


Fig. 1.



Fig. 2.

because pain had developed. She had, in addition, a huge cystocele. I could make out that the atrophic uterus was pushed to the right by a very large tumor which occupied the left side of the pelvis and extended to the level of the umbilicus. It was

*Presented at a meeting of the Chicago Gynecological Society, February 15, 1935.

somewhat tender only in the lower portion. I diagnosed an ovarian tumor rather than an uterine fibroid, and that the symptoms were due to torsion. Operation under local and scopolamine and morphine, a midline incision was made just big enough to lift the tumor out of the abdomen. It arose from the right ovary but occupied the left side of the pelvis and abdomen, and had twisted 180 degrees on its pedicle. It was solid and extremely heavy, measured 18 by 11.2 by 9.8 cm., and weighed 1,400 gm. It was easy to untwist the pedicle, clamp and cut it, and remove the tumor. The patient made an uneventful and rapid recovery. The chief interest rested in the tumor itself, for it was very heavy and solid. Microscopic section showed a myofibroma with some bone formation (Figs. 1 and 2).

CHRONIC TYPHOID ABSCESS OF THE OVARY

REPORT OF A CASE

LOUIS A. SOLOFF, M.D., AND CLINTON S. HERMANN, M.D.,
PHILADELPHIA, PA.

(From the Pathological and Surgical Departments of the St. Joseph's Hospital)

THE complications of typhoid fever are manifold and most of them are well known. Ovarian abscess, however, is so rare that it is not even alluded to in the textbooks of gynecology and medicine. About thirty cases are on record, three of which are American. It is an interesting coincidence that the last American case we found was likewise reported from the St. Joseph's Hospital of Philadelphia by F. Hurst Maier in 1914.

Miss N. O., aged 44 years, was admitted on Dec. 14, 1934, to the St. Joseph's Hospital with the complaint of severe sharp pain in the lower half of the abdomen. The pain began suddenly at 9:00 p.m. of the previous evening and was relieved partly by a soapsuds enema. This was followed by soreness in the right lower half of the abdomen. Upon examination, acute tenderness and spasticity were found in the right lower quadrant, and immediate operation was advised. The preoperative diagnosis was acute appendicitis. The blood count revealed a slight leucocytosis with a mild Schilling shift to the left. Erythrocytes, 4,550,000; leucocytes, 11,800; hemoglobin, 11 gm. per 100 c.c. (Haden-Hauser). *Differential Count:* Neutrophilic polymorphonuclear leucocytes, 77 per cent (27 band forms); lymphocytes, 15 per cent; monocytes, 8 per cent.

There was nothing significant in the past history except for an attack of typhoid fever in September, 1928, more than six years previous.

At operation, the right ovary was occupied by a cyst 6.5 by 6 by 5.0 cm. It was encapsulated by a glistening, translucent membrane beneath which there was soft gray yellow tissue averaging 0.4 cm. in thickness. In one region there was a small oval golden yellow flat piece of tissue resembling corpus luteum. Beneath the soft tissue there was a calcified shell 0.6 cm. thick which had to be opened with a saw. The cyst was filled with a foul creamy green yellow purulent material. Microscopically, the soft tissue proved to be ovarian tissue. The pathologic diagnosis was chronic typhoid abscess of the ovary with calcification.

Direct smear of the purulent material showed gram-negative bacilli. Hanging drop revealed them motile. It was then that typhoid was first suspected and the organism was studied culturally completely, including glucose, lactose, and blood agar, Russell's, Endo's media, litmus milk and gelatin. Those studied verified the im-

pression of a typhoid infection. A Widal was done on the patient's blood and found to be positive in 1:800 dilution. The organisms were tested with typhoid immune serum and found to agglutinate in 1:800 dilution. Finally, the patient's serum was tested against the organisms themselves and found to agglutinate them in 1:1600 dilution. Two months later, the patient's Widal was still positive in a 1:400 dilution. No organisms were found in the urine or feces.

DISCUSSION

Maier gives Walsberg and Kummel credit for reporting, in 1888 and 1890, respectively, the first cases of suppuration of an ovarian cyst following attacks of typhoid fever. Werth, in 1893, however, was the first to demonstrate the organism bacteriologically and Wallgren, in 1879, the first to apply the Widal test. Then followed case reports at irregular intervals, a complete list of which is appended in the references.

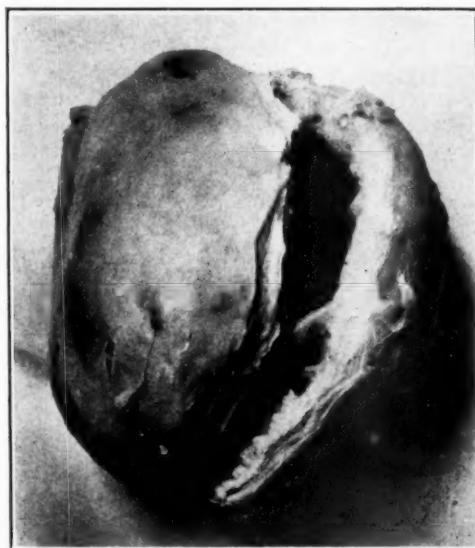


Fig. 1.—Chronic typhoid ovarian abscess showing peripheral calcification.

There are four possible routes by which typhoid fever may reach the ovary.
(1) By ascending infection from the genital tract. (2) By direct extension from neighboring infected organs such as the intestinal tract. (3) By lymphatic spread.
(4) Through the blood stream.

V. Oettingen reports an interesting case apparently illustrating the first avenue of infection. During a typhoid epidemic, a physician, immediately after examining a patient stricken with typhoid, did a vaginal examination on a woman who had recently aborted. The woman became sick and developed a long-continued fever. A growing ovarian cyst was palpable on bimanual examination. The Widal was strongly positive but no organisms could be isolated from blood, urine, or feces. Upon operation, typical typhoid bacilli were found in the ovarian cyst. The possibility and probability of ascending infection in this case cannot be denied.

Most cases of typhoid abscess of the ovary occur in dermoid cysts. The few remaining have occurred in pseudomucinous cystadenomas. Ours alone, we believe, has occurred in a previously normal ovary. The greater preponderance of dermoid

cysts has been attributed by V. Oettingen to adhesions to the intestinal tract and consequent direct or lymphatic spread. Maier, on the other hand, believes the typhoid bacillus shows a greater affinity for bone as evidenced by typhoid periorbititis of the spine.

In all cases of typhoid infection of the ovary, a previous history of typhoid fever has been obtained. Inasmuch as typhoid fever in its earliest stages is always a septicemia, the hematogenous route is always at least theoretically possible.

Where there are no adhesions and no infection of the fallopian tube, as in our case, the hematogenous route is the only one possible. Perhaps circulatory disturbances, such as the kinking or twisting of a cyst with consequent temporary blockage of efferent vessels, passive congestion, and rupture of bacilli containing blood vessels, may explain the comparative frequency in cystic ovaries and the absence of circulatory disturbances in the normal ovary explains the comparative rarity in the latter.

The viability of the typhoid bacillus is notorious. Bland-Sutton reports a case of ovarian abscess with living bacilli sixteen years after the initial infection and our case represents more than five years. Usually, however, the ovarian complication is discovered one to eight months after the general infection or even during the course of the disease. It must be remembered, however, that typhoid abscess of the cyst or twisting of the pedicle may be the cause of its discovery. As stated previously, this may be the explanation for the apparent rarity in the normal ovary.

This study illustrates the value of bacteriologic examinations of obscure ovarian cysts.

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ABDOMINAL PREGNANCY, WITH DELIVERY OF A LIVING CHILD

A. CHARLES POSNER, M.D., F.A.C.S., NEW YORK, N. Y.

(From the Obstetrical Service of the Harlem Hospital)

B. P., COLORED, aged thirty, had given birth to two living children; one, weighing eight pounds, had been delivered normally in 1920, the other, weighing seven pounds, by forceps in 1922. A third pregnancy had been terminated at about three months. The family and personal histories were of no significance, except for an umbilical herniorrhaphy performed on the patient in 1931 at another hospital. Menstruation, which had begun at thirteen, had been regular every twenty-eight days until May, 1933, when "spotting" occurred; this was the last menstrual period.

In June, 1933, a diagnosis was made of uterine fibroids and a possible pregnancy, although the position and movements of the fetus could not be determined. The blood Wassermann reaction was four-plus, and antisyphilitic therapy was instituted. A roentgenogram taken June 9 revealed a five months' fetus displaced to the left, with evidence of a large mass in front and to the right. The Aschheim-Zondek test, performed June 12, was negative. The blood pressure was 128/80, the urine normal, and no signs of toxemia were present.

Late in August the patient came to the Antenatal Clinic complaining of a painful mass in the vagina, accompanied by a white, serous vaginal discharge. Minor complaints were of edema of the legs, headache, urinary frequency, dysuria, and terminal hematuria. She was told that the mass consisted of bulging membranes, and advised to return when in labor.

At 11:30 A.M., September 10, the patient presented herself for admission. Labor pains had begun at three o'clock that morning, at twenty-minute intervals.

Physical examination revealed an adult colored female having strong labor pains every ten minutes. Fever and chills were present, also. Abdominal examination showed a probable vertex presentation, with dorsum to the right. The fetal heart rate, in the left lower quadrant, was 140 beats per minute. Rectal examination was unsatisfactory. The cervix was entirely prolapsed; dilatation, one finger. The patient's tongue and lips were dry, the pharynx injected, the heart sounds of poor quality, the lower extremities edematous, and the reflexes hyperactive. The temperature was 100.2° F., pulse rate, 124; respiration, 32; blood pressure, 142/90. Blood culture and urinalysis were negative. The white blood count was 10,600; polymorphonuclear leucocytes, 68 per cent; transitional leucocytes, 3 per cent; lymphocytes, 29 per cent; red blood corpuscles, 3,800,000; hemoglobin, 60 per cent. Blood sedimentation time was 18 mm. in twenty-five minutes, 24 mm. in thirty-five minutes.

When the patient was examined again at two o'clock, she was dyspneic and ashen, and appeared older than her thirty years. The fetus seemed to be of about eight months' development, and presenting by the breech; no membranes or presenting part could be felt, however. The fetal heart rate was 160, in the left upper quadrant. In the culdesac was a large, hard, irregular mass, presumably a fibroid. The cervix, which was hypertrophic and edematous, was protruding from the vagina (Fig. 1). The anterior lip was eroded, and there was a left lateral laceration. A slight sanguinous discharge was present. The external os admitted two fingers.

After consultation laparotomy was decided upon because it was believed that delivery would be impossible otherwise and because abdominal pregnancy was suspected. The patient was prepared and sent to the operating room at 4:10 P.M. The abdomen was opened by a right paramedian incision under ether anesthesia. The uterus, about the size of a three months' pregnancy, was exposed. The rest of the abdominal cavity was occupied by a large sac filled with fluid and containing a fetus with its head to the left and feet to the right. The sac was brought to the anterior abdominal wall and opened. A living male child weighing seven pounds, thirteen and a half ounces, was delivered.

The patient's pulse became rapid, and immediate infusion was begun. The abdominal wound was closed in layers, and two Penrose drains with iodoform gauze were inserted into the sac. Preparation was made for transfusion. The patient went into shock in a few minutes and was revived by artificial respiration, carbon dioxide, adrenalin, and coramine. Relapse occurred, however, and death ensued at 6:50 P.M.



Fig. 1.—Patient in labor, showing completely prolapsed cervix.

At postmortem examination performed the following day, a bacterial endocarditis, hitherto unsuspected, was found, and also fatty degeneration of the aorta and coronary arteries. Septic emboli and infarcts were seen in the spleen, liver, and kidneys. The gallbladder contained inspissated bile and several large cholesterol stones; the bile ducts were patent. The stomach was distended with gas. Scattered throughout the peritoneal cavity and attached to the mesentery were small, apparently encapsulated masses which on section were of a dark brown color and of firm consistency; these masses were found to be blood clots. The placenta and membranous sac were implanted primarily on the left ovary and secondarily on the mesentery, loops of the small intestines, and left broad ligament. The uterus extended from two and one-half to three fingerbreadths above the symphysis pubis. It was of fair consistency and contained several intramural fibroids. One fibroid about the size of an orange was situated on the lower part of the posterior wall; there was also a small polyp on the posterior wall. The right tube and ovary were macroscopically normal. Histologic examination of the left ovary through the site of implantation revealed chorionic villi and syncytial cells. The section through

the isthmial portion of the tube showed a decidual reaction, but no chorionic villi. Implantation of decidual cells was evident in a section of the small intestine.

Aside from the rarity of abdominal pregnancy at term with live delivery, this case is of interest because of the negative Aschheim-Zondek test, because of the completely prolapsed cervix, and because of the death of the mother from shock due to the effect of the sudden release of pressure on a heart already weakened by unsuspected bacterial endocarditis.

1132 PARK AVENUE

INVERSION OF THE UTERUS IN TWO SUCCESSIVE PREGNANCIES*

PAUL C. FOX, M.D., OAK PARK, ILL.

THIS case was seen in consultation at the West Suburban Hospital, Feb. 19, 1935, at which time the following history was given. The patient, aged thirty-five, para ii, had just delivered a seven-pound boy normally. She had been in labor sixteen hours and forty minutes. As far as she knew her first confinement had also been normal. Her past history was entirely negative.

About thirty minutes after the delivery, the physician in charge used a moderate amount of Credè expression. He soon noticed a bulging at the vulva which he thought might be the head of a second child, but very soon the entire uterus with the placenta attached to the fundus extruded through the vagina. There was profuse hemorrhage and marked shock. The attendant immediately removed the placenta from the fundus and attempted to reduce the uterus. While reducing the uterus he felt what he thought was a pedunculated fibroid, but which later proved to be the partially inverted fundus. He then packed the uterus thoroughly and called for consultation. When first seen the patient was in profound shock and it was impossible to do anything further at the time except to treat the shock. She was given morphine, glucose solution intravenously, and later a blood transfusion. None of these measures were of any avail. The patient made a brief rally, but soon relapsed and died about six hours after the inversion had occurred.

In looking up the history of this patient's first confinement it was discovered that at that time (September, 1931) she was under the care of another physician, and following a normal confinement, and a normal amount of Credè, she had an inversion of the uterus which was immediately corrected and from which the patient made an uneventful recovery. The attending doctor at this first confinement did not report this accident to the patient nor to any one else because he felt that he might be criticized, and since the patient recovered he simply left well enough alone.

This case illustrates the fact that inversion of the uterus can occur in properly managed cases and that it is not necessarily the fault of the attending physician. I am personally acquainted with both of the men who took care of this patient, and after careful inquiry I am convinced that no undue amount of force was used in attempting to deliver the placenta at either confinement.

715 LAKE STREET

*Presented before the Chicago Gynecological Society, March 15, 1935.

LIPOMA OF THE BROAD LIGAMENT*

A. E. KANTER, M.D., CHICAGO, ILL.

A WOMAN, thirty-seven years of age, came to the hospital because of vaginal bleeding which had been present from September 17 to February 27, with the definite story that she had gone a number of days beyond her period. She had chills and fever, following which she had a severe hemorrhage. She consulted her physician who made a diagnosis of incomplete abortion and gave her something to relieve the pain. She had had four children, the youngest six years old.

Vaginal examination revealed the uterus very small and pushed over to the side. On the left side was a tumor mass rather soft, and reaching the crest of the ilium. With the story of chills, fever and a possible incomplete abortion, it was my belief that she had a hydrosalpinx on one side. On that diagnosis I opened the abdomen. The uterus was perfectly normal as were both tubes and ovaries. There was a tumor about the size of a large grapefruit situated in the broad ligament, pushing the sigmoid away. I opened up the broad ligament and easily enucleated a large lipoma with practically no bleeding. I closed the broad ligament and the patient made an uneventful recovery.

FETUS PAPYRACEOUS IN TWIN PREGNANCY

REPORT OF A CASE

JOSEPH G. CROTTY, M.D., CINCINNATI, OHIO

(From the Obstetrical Service of the Good Samaritan Hospital)

BOERLEIN, in 1931, reported a case of twin feti papyracei occurring in a triplet pregnancy, the third infant being delivered normally and at full term. He was able to find nineteen other cases in the literature including those of E. L. Moss (1921) and C. C. Wallin (1923). There are more frequent reports of single fetus papyraceous occurring in twin pregnancy, the other fetus being delivered at term. J. L. Mills reported such a case in 1923, and there are several other similar reports in American and foreign literature.

Mrs. B., a well-developed and well-nourished white gravida ii, twenty-six years of age, was admitted to the Obstetrical Service of the Good Samaritan Hospital (Cincinnati) on July 28, 1932, in active labor. Her previous pregnancy had terminated in a full-term stillborn infant, cause not known. Her last menstrual period began Oct. 20, 1931, and the present pregnancy had been entirely uneventful. Blood pressure and urine were normal and the Wassermann test was negative. Abdominal examination revealed a full-term pregnancy, O.L.A., fetal heart tones 140 in lower left quadrant. The cervix was well effaced, dilated about 4 or 5 cm., membranes were intact, the head was not quite engaged, and a hard, nodular mass presented at the internal os outside the intact membranes.

One hour later reexamination revealed the cervix completely dilated, the membranes still intact, the head engaged, and the hard, nodular mass now closely applied to the anterior vaginal wall.

One-half hour later the membranes ruptured and a full-term, living male infant was delivered spontaneously, simultaneously with a papyraceous fetus.

The papyraceous fetus was completely mummified, 1 cm. in thickness, and 14 cm. in length, and tallied quite closely with the descriptions and illustrations given in

*Presented at a meeting of the Chicago Gynecological Society, March 15, 1935.

textbooks. The umbilical cord extended as a thin fibrous cord to a crescentic, white, hard, fibrosed placenta, continuous with that of the normal infant. Each fetus was surrounded by a separate amniotic and chorionic sac, but the sac with the papyraceous fetus contained no fluid.

3440 EDWARDS ROAD

A MODIFIED VAGINAL SPECULUM

WILLIAM D. FULLERTON, M.D., F.A.C.S., CLEVELAND, OHIO

WHEN local applications are made to the vaginal walls in the treatment of inflammatory conditions, particularly such as caused by the *Trichomonas vaginalis*, it is very important that every portion of the affected mucosa be well exposed and easily accessible for topical applications.

The great majority of vaginal speculums in use today have a relatively broad anterior and posterior blade, which when in use, cover a very considerable portion of the vaginal mucosa and interfere with satisfactory exposure. To turn or twist these speculums after they have been introduced into the canal is mechanically difficult and often causes much discomfort to the patient.

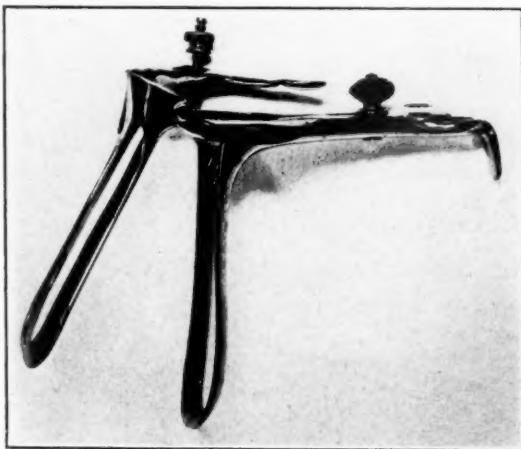


Fig. 1.

By a simple modification of the popular Graves' speculum this material objection is very satisfactorily eliminated. Both the anterior and posterior blades of the Graves' instrument have had their central portion cut out, leaving a fenestra, or window, the remaining skeleton edges of the blades are less than one-half cm. wide (Fig. 1). The instrument is made in three sizes, large, medium and small.

This modified instrument has clinically proved most satisfactory. Exposure of the vaginal walls is much more complete, and yet there is no material prolapse of the wall through the fenestra to obstruct the field of vision or to interfere with an excellent exposure of the cervix. Very rarely is even the slightest rotation of the speculum necessary to expose satisfactorily every portion of the vaginal mucosa at the same time.

NOTE: The instrument is made by the J. F. Hartz Company of Detroit, Michigan.

1508 KEITH BUILDING

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

CESAREAN SECTION STATISTICS IN CHICAGO HOSPITALS

THE Maternal Welfare Committee of The Chicago Gynecological Society has been making a study for the past year of all types of deliveries in Chicago hospitals. This report gives the results of the cesarean sections.

The appended table shows that the percentage of cesarean sections in the small hospitals is 6.81. As the number of deliveries per year increases, the percentage of cesarean sections decreases until a percentage of 1.63 is reached for a hospital delivering between 900 and 1,000 mothers a year. Thereafter the percentage increases to 2.98 in hospitals delivering 1,500 or more per year. For comparison two dispensary services are shown in the table.

There were 37 deaths reported in 1934 following cesarean section. Since 1,800 hospital deliveries have not been reported to this Committee and, assuming that the percentage is carried through, Chicago should have had approximately 1,000 cesarean sections in 1934. This would give a death rate of 3.7.

The number of patients who died following classical cesarean section bears a ratio almost two to one over the low cervical cesarean section.

CESAREAN SECTION DELIVERIES FOR 1934

Number of deliveries	-50	51-100	101-200	201-300	301-400
Number of hospitals	12	7	15	7	9
Number of deliveries	264	548	2,266	1,970	3,184
Low cervical	2	13	36	29	39
Classical	15	16	51	30	56
Porro	1	1			5
Vaginal		1	4	1	
Percentage cesarean sections	6.81	5.65	4.01	3.04	3.14
Number of deliveries	401-500	501-600	601-700	701-800	901-1,000
Number of hospitals	8	2	4	2	2
Number of deliveries	3,506	1,065	2,571	1,505	1,893
Low cervical	46	4	15	13	2
Classical	90	17	48	12	31
Porro	5	1	1	2	
Vaginal					
Percentage cesarean sections	4.00	2.06	2.13	1.78	1.63
Number of deliveries	1,001-1,100	1,500-plus	Dispensary	Grand	Total
Number of hospitals	3	3	2		76
Number of deliveries	3,132	9,012	2,422		33,338
Low cervical	53	210	8		470
Classical	28	39			433
Porro	1	20	3		40
Vaginal		2			8
Percentage cesarean sections	2.62	2.98	0.41		3.09+

Edward L. Cornell, M.D., Secretary.

Society Transactions

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF JANUARY 3, 1935

(See also page 151, July issue.)

The following papers were presented:

Hormonic Induction of Menstruation in Amenorrhea of from Three Months' to Nine Years' Duration. Dr. Chas. W. Dunn, by invitation. (For original article, see page 186.)

The Treatment of Abruptio Placentae. Drs. John A. McGlinn and W. Benson Harer. (For original article, see page 226.)

MEETING OF MARCH 7, 1935

The following papers were presented:

Current Technics for Obstetric Analgesia and Anesthesia. Dr. C. Gould and Dr. B. C. Hirst. (For original article, see page 257.)

The Therapeutic Value of Low-Dosage Irradiation of the Pituitary Gland and Ovaries in Functional Menstrual Disorders. Dr. C. Mazer and Dr. L. Spitz, Jr. (For original article, see page 214.)

Vaginal Aplasia and Creation of an Artificial Vagina. Dr. S. L. Israel. (For original article, see page 273.)

The Primiparous Perineum After Forceps Delivery. Dr. F. B. Nugent. (For original article, see page 249.)

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF JANUARY 18, 1935

(See also page 151, July issue.)

The following paper was presented:

Extrauterine Pregnancy. Drs. J. E. Fitzgerald and J. J. Brewer. (For original article, see page 264.)

CASE REPORTS

Ovarian Pregnancy. Dr. H. J. Holloway. (See page 286.)

Human Ovum in a Salpingitis Isthmica Nodosa. Dr. A. F. Lash. (See page 287.)

MEETING OF FEBRUARY 15, 1935

Symposium on Cesarean Section

The following papers were presented:

Porro Cesarean Section. Drs. A. F. Lash and W. G. Cummings. (For original article, see page 199.)

Cesarean Section: An Analysis of 500 Consecutive Operations. Dr. Edwin F. Daily. (For original article, see page 204.)

An Analysis of 381 Cesarean Section Cases in a Ten-Year Period at Michael Reese Hospital. Drs. I. F. Stein and M. L. Leventhal. (For original article, see page 192.)

MEETING OF MARCH 15, 1935

The following papers were presented:

A Series of 627 Vaginal Hysterectomies Performed for Benign Disease With Three Deaths. Dr. N. Sproat Heaney. (For original article, see page 269.)

Total Versus Subtotal Abdominal Hysterectomy in Benign Uterine Disease. Dr. Edward H. Richardson. (For original article see page 237.)

CASE REPORTS

Fibromyoma of the Tube. Dr. Marshall Field.

Myofibroma of the Ovary with Heteroplastic Bone Formation. Dr. I. D. Stein. (See page 289.)

Inversion of the Uterus in Two Successive Pregnancies. Dr. Paul C. Fox. (See page 295.)

Lipoma of the Broad Ligament. Dr. A. E. Kanter. (See page 296.)

Luker, S. Gordon: Retroversion of the Uterus, Brit. M. J. 2: 760, 1934.

In classifying the types of retroversion of the uterus the author points out that they are either congenital or acquired. The congenital group in single women may give no symptoms or they may cause symptoms of increasing severity as the patient grows older. Married women with a congenital retroversion may complain of dyspareunia, sterility or miscarriages.

In the acquired group, the cause is usually found in a preceding miscarriage or labor. In the author's experience, 13 per cent of primiparas had retroversion one month after delivery; 3.5 per cent of multiparas.

In discussing the treatment of the congenital type the author states that single women should generally be left alone. In young married women the condition may be treated by manipulation and a pessary and, if symptoms persist and the uterus cannot be replaced, or if the symptoms are ameliorated by a pessary, but the uterus will not remain in the anterior position without the aid of a pessary, then an operation is indicated.

In the treatment of the acquired type, the author stresses prophylactic measures which include adequate bed rest for twelve days with instructions as to posture, immediately following delivery or miscarriage; routine postnatal examinations with correction of any malposition of the uterus by a Hodge pessary; instruction of the patient in suitable exercises to promote involution of the uterus and pelvic floor.

The author then lists the indications for operation as follows: (a) when the retroversion is fixed or is complicated by adhesions or by chronic pelvic inflammation; (b) when the retroversion is giving rise to symptoms which are increasing; (c) when the retroversion, though mobile and simple, causes symptoms which disappear after correction of the displacement and insertion of a pessary; (d) when the retroversion is causing sterility; and (e) when the retroversion is causing miscarriage.

The operation of choice is stated to be the modified Gilliam operation and it is described in detail.

F. L. ADAIR AND I. C. UDESKY.

American Journal of Obstetrics and Gynecology

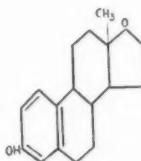
EDITORS: GEORGE W. KOSMAK, M.D., AND HUGO EHRENFEST, M.D.

Editorial Comment

The Relationship Between Estrogenic Substances and Cancer

OF RECENT years there has been a tendency for research work on certain aspects of malignant disease and on the sex hormones to run in parallel directions. Furthermore some writers have claimed that these researches not only run parallel but also tend to converge on common ground, thus implying that the action of the sex hormones may be concerned with the production of malignant disease. It is as well, therefore, that an authoritative statement be made as to the present position of these two important branches of investigation.

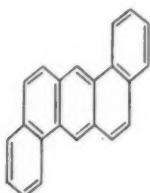
We may begin with the question of sex hormones. Through the work of Allen and Doisy and other American investigators it has been possible to obtain during the last fifteen years a stable form of the estrous-producing hormone which is known to contain only carbon, hydrogen, and oxygen. Mainly through the work of German investigators (Butenandt, et al.) the actual chemical constitution of this substance has been elucidated. It has been shown to belong to the group of organic compounds known as the condensed carbon ring series. The carbon ring skeleton is the same as that occurring in the familiar sterols such as cholesterol, ergosterol, and the bile acids. The constitution is shown in the following formula.



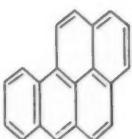
This compound is now available in a pure state in relatively large quantities, and through the work of Kaufmann, an entirely new form of ovarian therapy has been evolved. This employs doses of very much greater magnitude than have hitherto been considered.

If we turn to the field of cancer research, the connection between these apparently separate subjects may be explained. It was originally shown by the Japanese workers, Yamagiwa and Ichikawa that malignant

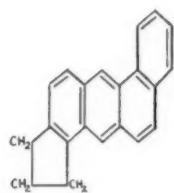
changes could be induced in the skin of mice by the prolonged application of tar. A long and elaborate series of investigations by English workers (Kennaway, et al.) has shown that the carcinogenic principles in tar belong to the condensed carbon ring group of compounds. They have been able to isolate and to synthesize a series of active carcinogenic agents, of which the three main compounds are 1:2:5:6-dibenzanthracene, 1:2-benzpyrene and 5:6-cyclo-penteno-1:2-benzanthracene. The formulas of these are given below.



1:2:5:6-dibenzanthracene.



1:2-benzpyrene.

5:6-cyclo-penteno-
1:2-benzanthracene.

It can be seen that these compounds possess certain points in common with the estrous-producing hormone. They contain a series of six membered carbon rings fused together and most of the compounds contain a phenanthrene nucleus.

A third line of work was commenced by the English group of workers (Cook, Dodds, et al.), who showed that certain simple phenanthrene and dibenzanthracene derivatives were capable of producing estrus in ovariectomized animals. These workers were also able to show that it was possible to have a molecule, such as 5:6-cyclo-penteno-1:2-benzanthracene, capable of inducing malignant changes when applied over a long period. Likewise this could produce estrus when injected subcutaneously in very large doses. They also found that even pure calciferol in large doses would develop estrus.

It can well be seen that a superficial knowledge of the subject might lead the untrained observer to suspect that the estrous-producing hormone itself might in fact be capable of causing malignant changes. An extensive search of the literature fails to reveal any incontrovertible evidence that the estrous-producing hormone is carcinogenic. There have been suggestions that injections of very large quantities of estrin would produce metaplastic changes in the uterus, bearing some slight resemblance to precancerous changes. Again too much significance should not be placed on the similarity of molecular structure of these substances. For example, no one would ever suggest that there were possibilities of inducing male changes in women by the injection of the estrous-producing hormone, yet it has a similar molecular structure. It must be remembered that the only difference existing between the male and female sex hormone is that one carbon ring is fully hydrogenated in the former.

E. C. Dodds.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D.

Selected Abstracts

Uterine Carcinoma

Kolegajew, G. A.: The Etiology and Malignant Degeneration of Leukoplakia of the Cervical Mucosa, Monatschr. f. Geburtsh. u. Gynäk. 93: 166, 1933.

The author examined 3,067 women without the colposcope and found leucoplakia in 15 or once in 204 women.

Leucoplakia develops slowly and without serious symptoms. Only in cases involving the clitoris and the introitus do pruritus and hyperesthesia call attention to it. When in these areas the process is extensive and associated with atrophy it is more often called kraurosis. Sometimes leucoplakia disappears after months or years.

Menstruation causes the epithelium to desquamate and the leucoplakia becomes less distinct but five or six days after the menses there is a return of the prominence of the lesion.

The etiology of leucoplakia is not clear. Some consider it to be due to syphilis and others regard it as a forerunner of cancer. In the author's 28 cases there were inflammatory changes in the uterus and adnexa in 89.2 per cent of all the cases, carcinoma in 3.6 per cent and healthy genitalia in only 7.2 per cent. Not one patient had syphilis. Hence the author believes that the most important etiologic factor is a chronic inflammation. He does not believe that all cases of leucoplakia are forerunners of carcinoma, but cautions that all women with erosions, polyps and leucoplakias should be examined at regular and frequent intervals. When leucoplakia is detected a biopsy should be performed even in the presence of a pregnancy. When doing the biopsy the entire leucoplakic area should be removed in one piece.

J. P. GREENHILL.

Paucot, H.: Cancer of the Cervix and Hereditary Syphilis, Bull. Soc. d'obst. et de gynéc. page 227, 1934.

The author maintains that inflammatory and chronic lesions of the cervix favor the development of cancer in this area. He, therefore, recommends treatment of inflammations by means of surgical removal or cauterization. He emphasizes particularly that hereditary syphilis plays a rôle in the causation of cervical cancer. In 14 such cases he found evidences of syphilis in 50 per cent. In nearly all the cases, the syphilitic lesions were of the hereditary type.

J. P. GREENHILL.

Graves, Wm. P.: The Detection of the Clinically Latent Cancer of the Cervix.
Surg. Gynec. Obst. 56: 317, 1933.

The Schiller test is based on the discovery by Lahm that the upper layers of normal epithelium of the portio and vagina contain rich masses of glycogen which disappear when the epithelium becomes cornified or changed by cancer. In the normal living tissue the glycogen of the upper layer of cells is stained in a few seconds a deep mahogany brown by iodine in watery solution (Lugol's). A superficial area of early cancer being devoid of glycogen does not receive the stain and stands out startlingly white or pink against the deeply colored almost black background of the normal tissue.

Any area of the portio no matter how small that does not take the stain must be regarded with suspicion. It then is removed with a specially sharpened spoon curette, placed immediately in hardening solution and sent to laboratory for study.

The test is of limited value in diagnosing advanced cancer, since the superficial assimilation stage is usually lost in the mêlée of self-reproducing cells. Sometimes superficial areas detectable by the Lugol test may be found beyond the border of the advanced cancer especially in the fornices of the vagina, and this may serve as a guide in determining the limits for a radical operation. Cancer cells in the advanced stage may regain glycogen and thus give a dark stain with the Lugol's solution. Normal epithelium lying above an invading cancer takes a normal stain as would be expected.

The Schiller test is an indispensable aid in the search for early curable cancer of the cervix. It is specific for the absence of cancer. Failure of the stain indicates certain other abnormal conditions, two of which, leucoplakia and intensive cervicitis, are potential precursors of cancer and require treatment. The test is recommended for trial to the general profession.

WILLIAM C. HENSEK.

Burger, P.: Hemorrhages After the Menopause and Exploratory Curettetment,
Gynécologie 32: 129, 1933.

Postclimacteric hemorrhages except those due to cancer of the cervix are more often due to benign than to malignant conditions. Among the 90 patients observed by the author, the bleeding was due to carcinoma of the cervix in 33.3 per cent, to cancer of the body in 15.6 per cent, to benign conditions in 37.8 per cent, etc. This fact does not diminish the truthfulness of the old axiom that every woman who bleeds after the menopause should be suspected of having cancer; 60 per cent of all his cases had a malignancy. A diagnosis should be made as soon as possible by means of an exploratory curettetment.

J. P. GREENHILL.

Hann, K.: The Question of Stump Carcinoma, *Monatschr. f. Geburtsh. u. Gynäk.* 95: 91, 1933.

Hann reports three cases of carcinoma which occurred in the cervical stump after supravaginal hysterectomy. It was decided to examine with the colposcope the cervix of every woman who had had a supravaginal hysterectomy from 1925 to 1931. In a series of 570 such cases, examinations were made in 205 cases. Aside from one case of carcinoma of the stump which was observed irrespective of the colposcopic examination, matrix changes were found in 5 cases. Since the incidence of matrix changes is the same in healthy women as in those operated upon and since carcinoma of the cervix always is engrafted upon matrix changes, the type of operation performed has nothing to do with the development of carcinoma of the cervix.

The author is of the opinion that it is not necessary to perform a total hysterectomy routinely, first because stump carcinoma is uncommon and second because by means of the colposcope we may detect the forerunners of cancer and thereby are enabled to remove the stump early. His recommendation is as follows: Examine every woman with the colposcope before operation. If the cervix is normal, leave it. If matrix changes are observed in the cervix, the latter should be removed by means of amputation through the vagina. These women as well as all others should be colposcopied at least once every year or two. If matrix changes are observed in a cervix after supravaginal hysterectomy it is simple to remove the cervix extra-peritoneally.

J. P. GREENHILL.

Diseases of Respiratory and Circulatory Systems and Intestinal Tract Complicating Pregnancy

Lamb, A. E.: Heart Disease in Pregnancy, Am. J. M. Sc. 187: 177, 1934.

The incidence of cardiac murmurs in pregnant women in this series was 6.1 per cent. Of these 2.7 per cent had organic heart disease, while 3.4 per cent had only functional murmurs and no detectable lesion. None of these patients showed the slightest evidence of cardiac strain during pregnancy, and follow-up studies showed that nearly all of these functional murmurs disappeared after delivery. Rheumatic heart disease causes about 90 per cent of the heart lesions in pregnant women. The most frequently observed lesion is mitral stenosis with or without insufficiency. A third of the cases of mitral stenosis became decompensated, while no case of uncomplicated mitral insufficiency decompensated, demonstrating the importance of differentiating between these two lesions. It was noted that five patients out of those with or without organic heart disease, who were able and unable to carry on ordinary physical activity without discomfort, decompensated, which is at variance with the work of Pardee, who asserts that these patients have an excellent prognosis. Outside of functional classification, other factors such as age of the patient, family environment, duration of the heart disease, and the extent of the valvular lesion must be considered. Most of the patients who decompensated did so before the onset of labor, and there was no relationship demonstrated between the month of pregnancy and the onset of decompensation. The mortality was 7.5 per cent; two of these deaths were probably preventable. Comparison of the mortality of patients with and without prenatal care shows a death rate of 2.2 per cent for the former, and 20 per cent for the latter, demonstrating the importance of prenatal care. The limited follow-up showed that 43 per cent were worse following pregnancy.

J. THORNWELL WITHERSPOON.

Gilchrist and Murray-Lyon: Does Pregnancy Hasten the Fatal Termination in Rheumatic Heart Disease? Edinburgh M. J. 40: 587, 1933.

Pregnancy and labor impose a burden on the healthy heart. For this reason the symptoms of preexisting organic heart disease become, as a rule, greatly accentuated as pregnancy advances.

A study has been made of 109 cases of fatal cardiac rheumatism in an endeavor to discover the effect of repeated pregnancies on the course of the disease. A comparison has been made between males, nulliparous and parous women regarding their average age at death, mode of dying, duration of the cardiac disease and the rate of progression to the fatal termination.

All the patients suffered from mitral stenosis either alone or in association with other valvular lesions. No significant difference was found in the duration of the disease in nulliparous and parous women. The course of the disease appeared to be shorter in the male cases.

Auricular fibrillation is not necessarily an indication that an additional burden has been placed upon the heart during the childbearing period. Its incidence is largely determined by the length of survival from the time of the first involvement of the heart.

Congestive heart failure was the mode of death in 92 per cent of the whole group of cases. The fact that the parous women dying from congestive heart failure had families averaging 4.5 children each would support the contention that repeated childbearing accelerated their death.

Cerebral embolism accounted for all the remaining deaths with two exceptions. Parous women, dying from this cause, lived on the average twelve years longer than those who died from congestive heart failure. In spite of their longer life, their families only averaged 1.7 children. It would appear that by escaping the burdens of a large family they guard themselves against the risk of congestive heart failure at about thirty-eight years of age, only to die from embolism twelve years later. This appears to be about the maximum span of life for the individual dying from rheumatic heart disease.

While pregnancy should be avoided in the severer grades of rheumatic heart disease, one or two children may be borne without detriment by the majority of cardiac women. Repeated pregnancies, however, tend to shorten life in women suffering from rheumatic heart disease and ultimately increase the risk of death from congestive heart failure.

W.M. C. HENSKE.

Marbury, W. B.: Appendicitis in Pregnancy. Am. J. Surg. 19: 437, 1933.

Primary acute appendicitis occurs probably no more frequently in pregnant than in nonpregnant women. On the other hand, pregnancy is likely to cause an exacerbation of a previously pathologic appendix. Over 80 per cent of the reported cases occurred during the first six months. In nonsuppurative cases during the first six months the outlook for both mother and child is excellent. Later, the mortality increases parallel to the duration in months of pregnancy and duration in hours of the appendicitis. The first symptom is the constant contraction of the uterus that may occur as the result of appendicitis and can be so severe as to simulate the onset of labor. It is largely this symptom that makes it almost impossible to diagnose appendicitis after labor begins. The other deceptive factor is the displacement of the abdominal viscera by the growing uterus. The appendix is pushed up almost to the level of the gallbladder. Pain from a pathologic appendix in this area would be exceedingly difficult to distinguish from that produced by an inflamed gallbladder, a pleurisy, a renal colic or even a duodenal ulcer. Appendical pain must be sought at progressively higher levels as the months of pregnancy pass by. Pyelitis on the right side is the most frequent cause of error. It can coexist with acute appendicitis and should be either ruled out or definitely determined by ureteral catheterization. Other conditions that may cloud the picture are salpingitis on the right side, tumors of the adnexa, ovarian tumors with twisted pedicle, criminal interference, and intestinal obstruction.

There is little divergence of opinion among authors as to prompt operation during the first six months of pregnancy. After this, a complicating appendicitis is a surgical as well as obstetric problem, and since a mortality between 18 and 70 per cent is faced there is small wonder that there is less agreement. If unruptured, the appendix can be removed through a simple McBurney incision, and the chances

of aborting are slight. If there is a localized abscess the same procedure may be followed but there is much greater chance of abortion. If abortion occurs the change in the size of the uterus breaks up what protective adhesions have formed and allows the peritonitis to become generalized. Consequently it may be wiser to make a paramedian incision and empty the uterus by cesarean section first and deal with the appendix secondarily. Where generalized peritonitis is revealed at the time of exploration, infection of the endometrium is inevitable, therefore a Porro cesarean section should be done.

J. THORNWELL WITHERSPOON.

Gröné, O.: Perforation of the Stomach Associated With Approaching Labor. Cancer and Ulcer of the Stomach as Complications of Labor, Acta obst. et gynec. Scandinav. 13: 315, 1934.

The author describes a case of perforation of the stomach three or four weeks before expected delivery. After the diagnosis had been confirmed by laparotomy, the uterus was emptied by vaginal cesarean section (living child), and then the perforating ulcer in the stomach sutured with catgut. Neither peritonitis nor puerperal septicemia set in, but the patient died, under increasing cachexia, about three weeks after admission. The necropsy showed infiltrating cancer in the margin of a gastric ulcer.

Discussing the question of perforating peritonitis in connection with pregnancy, the author believes that immediate emptying of the uterus, in connection with an operation for perforating peritonitis, should be resorted to only in those cases where the size of the pregnant uterus prevents examination of the starting point for the peritonitis, and thus the rational treatment of the latter. From the viewpoint of aseptic surgery, vaginal cesarean section is the correct procedure but the author mentions several cases from literature, in which the uterus, in connection with laparotomy for peritonitis, was emptied abdominally without causing puerperal septicemia. The author briefly explains the reciprocal relation between carcinoma of the stomach and pregnancy and finally discusses the question of gastric ulcer in relation to pregnancy and delivery, pointing out especially that in connection with the delivery itself such alarming symptoms may arise from the latter, that special and immediate therapeutic measures become necessary. Among such symptoms he mentions particularly perforation of the ulcer into the free abdominal cavity, abundant gastric hemorrhage and pernicious vomiting. He illustrates these various complications by cases from his own experience. In one such, where there was abundant gastric hemorrhage, he performed an abdominal cesarean section; in another, where stenosis of the pylorus was the cause of vomiting, he induced premature delivery. In both cases good results were obtained. In another case it seemed proved that the delivery had a directly unfavorable influence on an organic stomach affection arising from a gastric ulcer.

J. P. GREENHILL.

Erratum

In the article by Robinson in the July issue, page 34, the second last line should read "the thyroid inhibits prolan A elaboration, and the adrenal that of prolan B."

Books Received

PRACTICAL ENDOCRINOLOGY. By Dr. Max A. Goldzieher, Endocrinologist, Gouvernor Hospital, etc. Illustrated and 326 pages. D. Appleton-Century Co., Inc., New York, 1935.

PRACTICAL SURGERY OF THE ABDOMINAL AND PELVIC REGIONS. By James William Kennedy, Surgeon-in-Chief to the Joseph Price Hospital, etc. Second edition, illustrated with 133 original half-tone plates, some in color, and 861 pages. F. A. Davis Company, Philadelphia, 1934.

WEIBLICHE GESCHLECHTSORGANE UND UNFALL. Von Professor Dr. August Mayer, Direktor der Universitaets-Frauenklinik in Tuebingen. 83 pages. Verlag von Ferdinand Enke, Stuttgart, 1934.

ELEMENTS OF EXPERIMENTAL EMBRYOLOGY. By Julian S. Huxley and G. R. de Beer. With 221 illustrations and 514 pages. Cambridge University Press—The Macmillan Co., New York, 1934.

THE AUTONOMIC DISEASES OR RHEUMATIC SYNDROME. By Dr. T. M. Rivers. 299 pages. Dorrance & Company, Inc., Philadelphia, 1934.

PHYSICAL AND MENTAL GROWTH OF PREMATURELY BORN CHILDREN. By Julius H. Hess, Professor of Pediatrics, University of Illinois; George J. Mohr, Director of Child Guidance Center in Pittsburgh; and Phyllis F. Bartelme, Psychologist, Cook County Juvenile Court in Chicago. 449 pages. University of Chicago Press, 1934.

TREATMENT OF COMMON FEMALE AILMENTS. By Frederick John McCann, Consulting Surgeon, Samaritan Free Hospital for Women, London, etc. Third edition, 379 pages. William Wood & Co., Baltimore, 1934.

ANESTHESIA AND ANALGESIA IN LABOUR. By Katharine G. Lloyd-Williams, M.D., Honorary Anaesthetist to the Royal Free Hospital in London, etc. With foreword by Dame Louise McIlroy, Professor of Obstetrics and Gynaecology, London School of Medicine for Women. 96 pages. William Wood & Co., Baltimore, 1934.

PROPEDEUTIQUE OBSTÉTRICALE. Par L. Devraigne, accoucheur de Lariboisière. 191 pages. Masson et Cie, éditeurs, Paris, 1934.

LA PRATIQUE OBSTÉTRICALE. Par L. Devraigne, accoucheur de Lariboisière. 244 pages. Masson et Cie, éditeurs, Paris, 1935.

TEXTBOOK OF NURSING TECHNIQUE. By Marion L. Vannier, R.N., and Barbara A. Thompson, R.N., Director of the Wisconsin Bureau of Nursing Education, etc. Second edition, revised, 265 pages. University of Minnesota Press, Minneapolis, 1935.

MANOBRAS E OPERACOES OBSTETRICAS, pelo Docente Dr. Joao Pereira de Camargo, Livre Docente da Faculdade de Medicina da Universidade do Rio de Janeiro, etc. Segunda edição corrigida e aumentada, contendo 15 trichromias, 242 cliches e 4 micropographias. 498 pages. Livraria Francisco Alves, Rio de Janeiro, 1935.

INTRODUZIONE ALLO STUDIO DELL' EUGENICA (Eredità biologica). Par Prof. Giuseppe Cristalli. Stabilimento Industrie Editoriali Meridionali, Napoli, 1934.